FEATURE

VISUAL AID: A VIRTUAL REALITY PRIMER

TEST

MICROSOFT SURFACE 3
Mainstream 2-in-1 gets serious

APPLE MACBOOK
Taking on netbooks head-on

ROBOTS RULE THE WORLD!
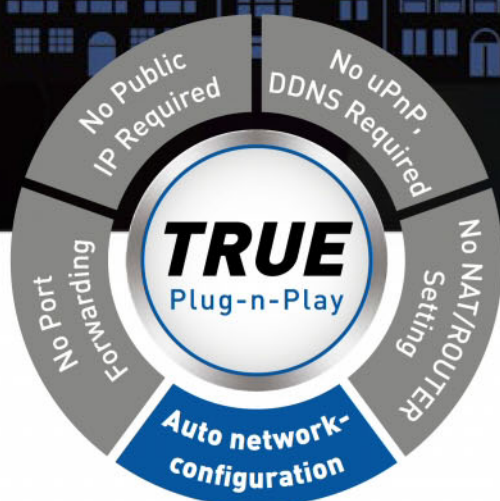
3D PRINTING, COMPUTEX 2015 AND MORE

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ROBUSTLY BUILT FOR OUTDOOR USE

Introducing the PROLiNK® PIC1008WN True Plug & Play Outdoor HD IP Camera with Dual Lens

No Public IP Required

No uPnP, DDNS Required

No Port Forwarding

No NAT/ROUTER Setting

TRUE Plug-n-Play

Auto network-configuration

As Easy As 1-2-3 Setup

1. Connect To Router
Connect the camera to the router through wired or use one touch WiFi security setup (WPS) for wireless connection

2. Download Apps To Mobile/Tablet
Mobile Access (Android & iOS):
Install the free application mLiveView/mLiveViewHD on your smartphones/tablets

PC Viewing (Windows):
Install LiveView software from CD (provided in the Setup CD)

Web Access (Internet Explorer):
Open http://www.fida.com/online.html

3. Scan QR Code To Add Camera
Scan the QR code to add camera.

Compatible with:

Microsoft Windows™ Designed for Microsoft® Windows

ANDROID

iOS

PIC1008WN
TRUE PLUG & PLAY
Wireless-N
Outdoor IP Camera

Motion Detection

Weather Proof

Zero Configuration

Auto Day & Night Mode

MicroSD & NAS Storage

Mobile Viewing

36 Multi-screen Monitoring

- High Definition MegaPixel
- Dual Lens & Sensors for Day and Night Operation
- Push Notification Alert*
- Weather-Proof
- One Touch WiFi Security Setup (WPS)
- Adjustable High Powered IR LEDs
- Power over Ethernet (PoE)
- Multiple Recording Methods**

System Requirements:
Windows XP/Vista/7/8, Android 2.2 & above, iOS 4.3.3 & above

FACEBOOK   TWITTER   YOUTUBE   WEBSITE

ED'S NOTE

THE CONSEQUENCES OF CHASING THE FUTURE

Working for a technology magazine, we unconsciously find ourselves wrapped up in the chase for the latest and greatest gadgets. And when do we write about them, it is mostly focused on what's new and interesting; what these gadgets are capable of; their specifications and improvements. Sometimes, we get to go behind the scenes to show you how things are made. Rarely do we ever talk about technology's impact on society, lifestyle and what it actually means to us.

The rise of social networking for example, is a paradigm shift in the way we connect, maintain those connections and communicate with people in general. Facebook, Instagram, Twitter, YouTube; they have become platforms for millions to express their views globally—for better and worse. I often refer to this as the age of wanton sharing, where information is pushed to you whether you want it or not, by your very own friends. On the flip side, this ease of communication has allowed discussion to flourish, sometimes even intelligent ones. I have found myself in the thick of more than a few.

Similarly, technology has completely desensitized us to the pervasive intrusion of our personal lives as we are the ones who are willingly capturing and sharing every aspect for the world to see. On the other hand, it has made us ever more aware of our actions because you'll never know if your little public outburst will become the next viral sensation.

The more we rely on technology, the more we fear the erosion of privacy when all our actions can be measured and tracked. However, to actively block these tracking tools will disable the very 'intelligence' that allows our smart gadgets and apps to provide that personalized experience in the first place.

The list goes on, but this is where you'll realize that technology is the mother of double-edged swords. In this issue of HWM, we explore how technology—from health and fitness to robotics and 3D printing—is changing the world for the better, yet at the same time may very well bring about our doom.

Zachary Chan
EDITOR

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ART DIRECTION **KEN KOH**

All prices quoted in this magazine
are in Singapore Dollars (SGD),
unless otherwise specified.

SINGAPORE HWM

NEW THIS MONTH

Every month, we receive dozens of product announcements and mentions, sit through many a launch event and try out all kinds devices. All these products are then carefully curated by our crack team of tech gurus. The final list is presented here in Gear and it is our hope you'll find something to geek-out to.

MORE INSIDE >

CASIO EXILIM EX-TR60
The selfie revolution continues.

ASUS ROG GR6
Heralding the age of the console-PC.

SANDISK DUAL USB TYPE-C
One drive, two connectors, winning.

HUAWEI ASCEND P8 MAX
6.8-inch large, 6.8mm thin.

APPLE 15-INCH MACBOOK PRO WITH RETINA DISPLAY

Apple's new 15-inch MacBook Pro with Retina display come with Apple's new Force Touch trackpad, which features built-in force sensors and a Taptic Engine that delivers haptic feedback. They also have better storage performance and longer battery life. Apple updated the discrete graphics with AMD's new Radeon R9 M370X mobile GPU.

SANDISK DUAL USB TYPE-C

Whether you like it or not, USB Type-C is the future. It provides numerous advantages such as greater transfer speeds and delivery of power, plus it is also smaller and reversible. To get ready for the onslaught of USB Type-C devices, there's the SanDisk Dual USB Type-C, a flash drive with both standard USB 3.0 and USB Type-C connectors.

CASIO EXILIM EX-TR60

Selfie fans listen up, the new Exilim EX-TR60 camera now gives you 12 levels of skin smoothness effects, six level of skin tone adjustments, and a Make Up Bracketing mode that gives you two additional images with each shot - one with two levels fairer skin tone and one with two levels darker skin tone so you have more options to go with each shot.

HUAWEI ASCEND P8 MAX

The 6.8-inch Ascend P8 Max boasts the highest screen to body ratio of any smartphone out there (83 percent!). Despite its huge size, the P8 Max remains thin, measuring just 6.8mm. The P8 Max is powered by a octa-core Kirin 930 64-bit processor with a generous 3GB RAM.
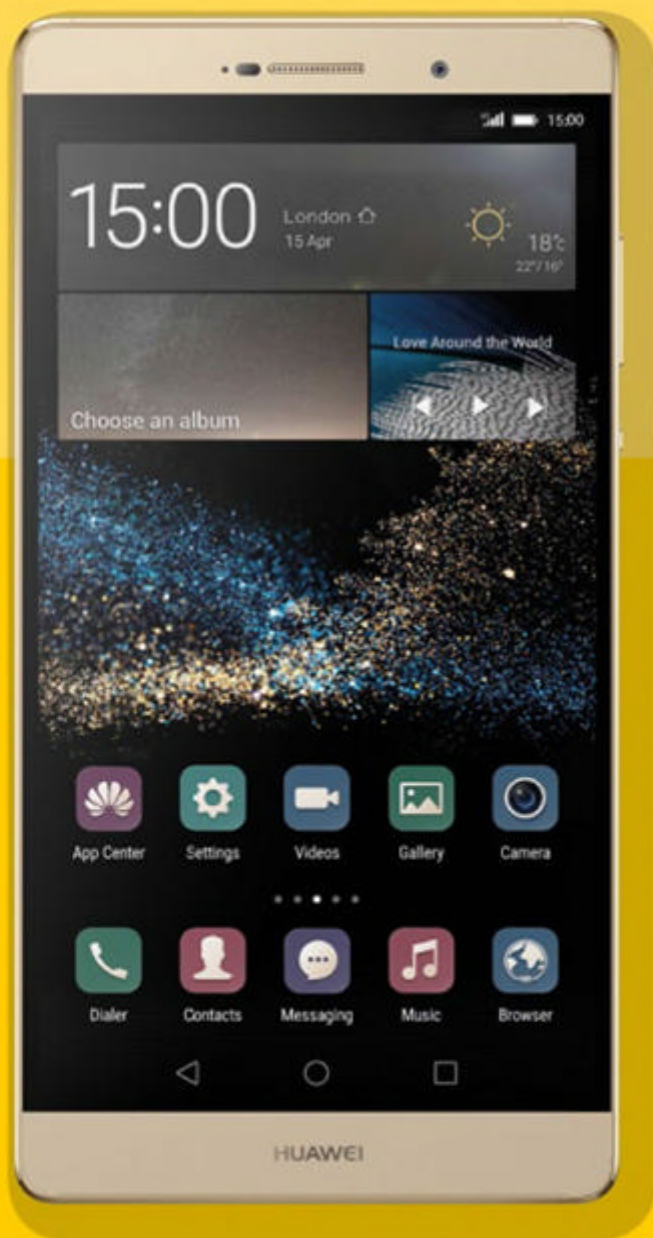
BLACKMAGIC MICRO CINEMA CAMERA

The world's smallest digital film camera sports an intuitive remote control interface and 12-bit RAW and ProRes recording capabilities. It is highly customizable and supports a wide range of professional lenses and almost limitless expansion options, allowing you to capture almost anything with its Full HD sensor and 13 stops of dynamic range.

BENQ XL2730Z

The 27-inch XL2730Z boasts a 2,560 x 1,440, 144Hz refresh rate and 1ms GTG response time. It is also compatible with AMD's FreeSync technology, which eliminates tearing or stuttering that arises when the panel's refresh rate is out of sync with the graphics card. Textures, landscapes and colors appear crisp and sharp on its quad HD display with BenQ's Black Equalizer and Motion Blur Reduction 2.0, providing the finest, smoothest and fastest display performance for any gamer.

LG CORDZERO HOM-BOT SQUARE

The all new LG CordZero HOM-BOT Square is not your usual robotic vacuum cleaner. Design with a square shaped body and installed with longer side brushes to help reach those difficult corners, the HOM-BOT Square have also been upgraded with II-SLAM technology and digital bumper that minimises wandering and collisions. Perfect for the domestic geeks that wants to simplify their cleaning experience.

NEC UM351W

Designed for schools and workplace use, the NEC UM351W is a 3,500-lumen ultra-short-throw LCD projector. It packs a comprehensive set of inputs and outputs, including dual HDMI and VGA ports. It also has a pretty powerful 20W built-in speaker. If you're looking for a complete interactive projector solution, you can easily achieve it by adding the optional NP03Wi interactive system with dual pens.

MICROSOFT LUMIA 640 XL

The Lumia 640 XL is powered by a 1.2GHz quad-core Qualcomm Snapdragon 400 processor with 1GB of RAM. While it only has 8GB of onboard storage, a microSD slot supoprts cards up to 128GB. It also has a 13-megapixel rear camera with Zeiss optics and a 5MP front-facing camera that does 1080p video. Expectedly, the phone runs Windows Phone 8.1 and the Lumia Denim update out of the box; but can be upgraded to Windows 10 when it arrives.

ASUS ROG GR6

The ASUS ROG GR6 gaming desktop PC is gaming console-inspired PC that packs an Intel 5th-generation CPU and Maxwell-based NVIDIA GeForce GTX 960M graphics card. It comes bundled with the ASUS ROG Sica ambidextrous gaming mouse and RA01 keyboard. It touts quiet operations, making it an ideal gaming system for the living room or bedroom. The ROG GR6 will ship with Windows 8.1, but will also have support for SteamOS.

SONY
XPERIA Z4

The recently announced Sony Xperia Z4 probably didn't get the reaction Sony expected from the public. It looked the same as the Xperia Z3 and had specs that weren't as huge a leap in hardware as most expected. Despite those issues, the Xperia Z4 will probably be a solid phone, at least for Playstation gamers. With the Xperia devices the only sources of Remote Play, if gamers want the latest phone with the ability to Remote Play, the Xperia Z4 is it.

WIRELESS MUSIC MADE EASY

Get all your music – wirelessly, effortlessly – through the air, with Bose SoundTouch™ Wi-Fi

SOUNDTOUCH™ MAKES IT EASY TO STREAM YOUR MUSIC WIRELESSLY

We used to shuffle our music around on cassette tapes, CDs, and through cables plugged into computers onto mobile media players. Today, it's more likely that our music lives in the cloud, and we send more music through the air from our mobile devices rather than through physical cables.

Which is why making Wi-Fi music easy to set up is so important. Nobody wants to deal with complicated connections, and that's why the Bose SoundTouch™ systems get it right.

The SoundTouch™ systems are simple, friendly and intuitive, making it a breeze to get music from your smartphone, tablet, notebook, PC or streaming service, and have it playing throughout your house, through Bose's high-fidelity speakers, on Wi-Fi.

Because it's connected to the Internet, you can set up SoundTouch™ to work effortlessly with Deezer™ and Spotify®, as well as stream 20,000 Internet radio stations from around the globe. Play the same songs from room to room, or play different music in each room.

You can set up to six presets on SoundTouch™ systems, for instant access to your favorite music service, Internet radio station or playlists from your personal library – all at the touch of a single button. Once it's set up, you won't always need your phone or tablet to stream music, just press one of the presets and you're listening to your favorite music instantly.
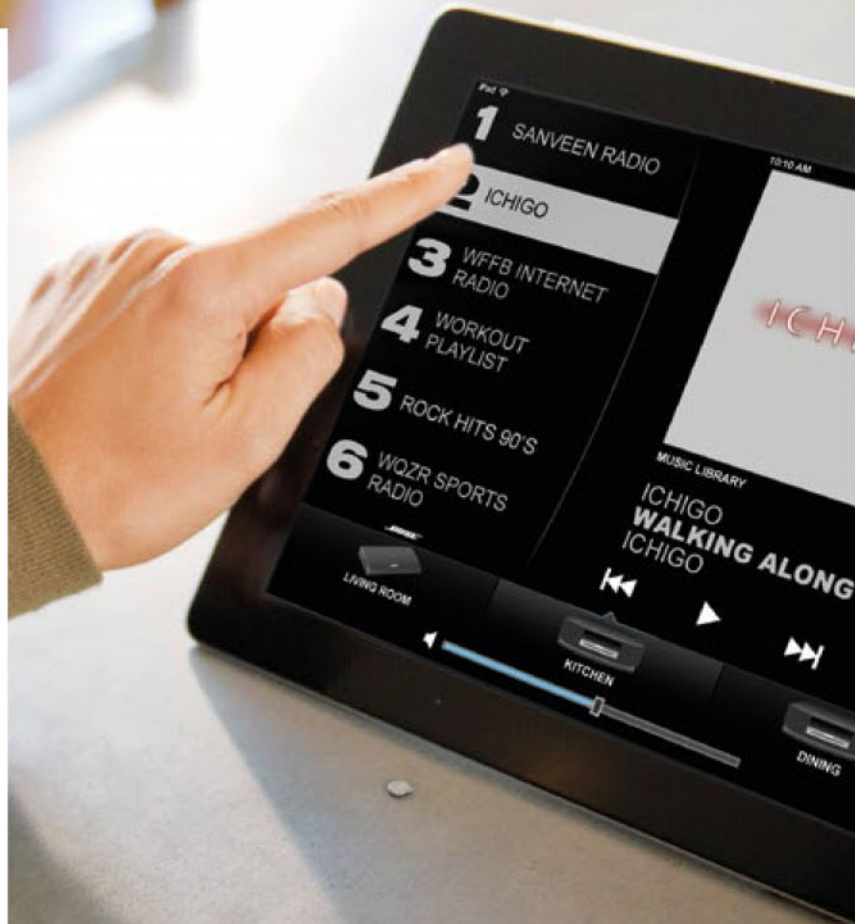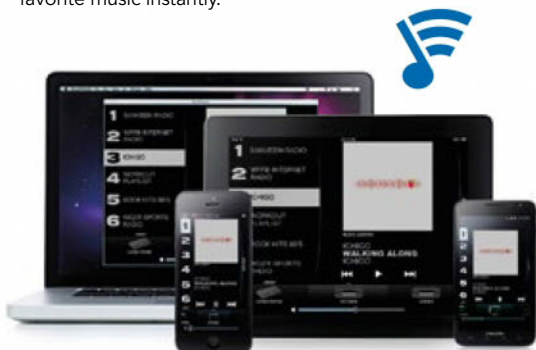
BOSE LIFESTYLE® SERIES III HOME ENTERTAINMENT SYSTEMS AND CINEMATE® HOME THEATRE SYSTEMS

The Bose Lifestyle® 535/525/135 Series III are Bose's best home theater systems, delivering vivid sound from elegant speakers and a hideaway Acoustimass® module. The CineMate® line of home theater systems offers incredible sound with easy setup, and let you enjoy music loud and clear with the full impact of Bose cinematic sound. Both systems work work with SoundTouch™ technology to stream music wirelessly.

SOUNDTOUCH™ MUSIC SYSTEMS SERIES II

The new, one-piece SoundTouch™ Music Systems Series II system gives you the highest quality audio for Wi-Fi speakers of this size. The SoundTouch™ 30 Series II provides best-in-class performance, and the SoundTouch™ 20 Series II delivers rich, compelling sound in a sleek design. Their compact designs make the SoundTouch™ Series II a perfect fit in any room.

SOUNDTOUCH™ STEREO JC SERIES II

Enjoy deep, detailed sound and pristine vocals from the new, standalone SoundTouch™ Stereo JC Series II Wi-Fi music system. It comes with two sleek, redesigned Jewel Cube® Series II speakers with precisely angled transducers for spacious sound. A hideaway Acoustimass® module delivers deep bass for rumbles you can feel.

WIRELESS SOUND FOR THE WHOLE HOME MADE EASY

There's never been an easier way to enjoy music throughout your home. Because SoundTouch™ connects through Wi-Fi, the wide range of sound systems – from one-piece speakers to portable speakers to home theatres – all work together on the same network.

Unlike Bluetooth® audio which has limited range, you can play the same music everywhere, create customized zones or listen to different music in different rooms, even outside with the SoundTouch™ outdoor speakers. Bose makes installation a breeze, with step-by-step guided setup, intuitively designed apps and easy to use systems.

TAKE YOUR PHOTOGRAPHS TO THE NEXT LEVEL

The EOS 760D and EOS 750D deliver advanced features in friendly designs that feel familiar to new and experienced photographers alike.

Modern technology, timeless images

The EOS 760D and EOS 750D both come with 24.2MP sensors, creating high-resolution images rich with detail and lush colors. Canon's powerful DIGIC 6 image processor allows the cameras to track fast-moving subjects, freezing action at quick bursts of five frames per second. The cameras shoot from ISO 100 to 12,800 natively (expandable to ISO 25,600), allowing them to capture images even in extremely low-light environments.

The EOS 760D and EOS 750D use a new 19-point all cross type AF (auto-focus) system, which ensures all subjects, still or moving, are kept in precise focus, no matter which orientation you hold the camera in. A specialized RGB+IR metering sensor reduces AF error and makes white balance even more accurate for true-to-life colors.

Both cameras shoot video in high Full-HD quality, and the EOS 760D has a unique ability to shoot High Dynamic Range (HDR) movies, which retains more detail in scenes with high contrast lighting.

Professional controls, user-friendly design

The EOS 760D is an ideal choice for photographers wanting to become familiar with manual settings and professional controls. It is the first entry-level camera to come with a top LCD panel in addition to the main display. This LCD panel, usually found only on professional models, displays important information at a glance and lets you know if you need to quickly change your settings.

The EOS 760D also comes with a Quick Control Dial and Main Electronic Dial, advanced controls that let you adjust settings and search for images quickly. The EOS 750D is designed with navigation buttons, and is an easy way for users more familiar with entry-level cameras to access the DSLR camera's advanced features.

Familiar from the start

The EOS 760D and EOS 750D are designed to be quickly familiar, whether you just upgraded from a digital compact camera, smartphone, or DSLR. Users not used to the viewfinder can shoot using Live View on the back LCD monitor, and the new Hybrid CMOS AF III system makes focusing as easy as pointing and shooting. The new AF system is even faster than before, and can track subjects even as they move around the frame.

The LCD screen is touch-sensitive, so you can adjust settings with the touch of a finger. Both cameras' Vari-angle LCD panels make it easy to get creative with angles and framing. Hybrid CMOS AF III is also active during video recording, keeping the right subjects in sharp focus, even if they move around.

WHAT ARE THE MAIN DIFFERENCES BETWEEN THE EOS 760D AND EOS 750D?

The EOS 760D is a premium entry-level camera for hobbyists who enjoy more in-depth control of their gear and want to go deeper into the nuts and bolts of digital photography. It offers more manual control and advanced features.

The Canon EOS 750D is a DSLR camera for casual and enthusiast photographers who want to take the next step up in their photography. It fuses excellent image quality and performance with a user-friendly interface.

	CANON EOS 760D	CANON EOS 750D
Resolution	24.2MP	24.2MP
Sensor Size	APS-C (22.3 x 14.9mm)	APS-C (22.3 x 14.9mm)
ISO	100 – 12,800 (expandable to 25,600)	100 – 12,800 (expandable to 25,600)
AF System	Hybrid CMOS AF III	Hybrid CMOS AF III
AF Points	19 (all cross-type)	19 (all cross-type)
Continuous Shooting	5 frames per second	5 frames per second
Touchscreen LCD	Yes	Yes
Top LCD Panel	No / Yes	No
Quick Control Dial	Yes	No
HDR Movies	Yes	No
Wi-Fi with NFC	Yes	Yes
Dimensions	Approx. 131.9 x 100.9 x 77.8mm	Approx. 131.9 x 100.7 x 77.8mm
Weight (body only)	Approx. 520g	Approx. 510g

To find out more about the Canon EOS 760D & EOS 750D, go to **www.canon.com.sg**

SIZE DOESN'T MATTER

The ASRock X99E-ITX/ac is a dream come true for small system builders who have always wanted to take advantage of the sheer power of the Intel X99 platform but found themselves constrained by traditionally large motherboards. Now, with the world's first mini-ITX X99 motherboard, enthusiasts can combine the performance of Intel LGA 2011-3 CPUs with a powerful single graphics card in a small package. The board comes crammed with quality components and even supports the latest PCIe-based SSDs. **ASRock X99E-ITX/ac**

LIGHTNING-FAST FILE TRANSFERS

If you're looking for some music to go along with your workout, the Sennheiser MX 686G Sports has an open designs so you can still get audio cues from your surroundings - handy if you're biking or running out doors. It also features flat cabling as well as a handy in-line remote with integrated microphone so you can take calls on the move. **Sennheiser MX 686G Sports**

CUTTING CORDS WHILE CHARGING

In today's wireless world, it can seem awfully dated to go through the motions of plugging your phone into a power socket. Enter the VU Solo Wireless Charger, a Qi wireless charging pad for your smartphone. It features an anti-slip premium silicon surface that ensures your phone won't move out of place while charging. It also comes with an alignment ledge to help you position your phone for optimum charging. **TYLT VU Solo Wireless Charger**

FAST AND ACCURATE.

The Nikon 1 J5 is quite possibly Nikon's fastest camera yet, boasting a continous shooting speed of approximately 20 frames per second, and an AF system that practically covers the entire frame, with 171 focus areas - of which 105 are phase-detect points - for quick and accurate focusing between shots. **Nikon 1 J5**

BIG STORAGE

Toshiba's new 3TB Canvio Connect II drive is the first 3TB portable external hard disk drive in the world. As its name suggests, the Canvio Connect II comes with additional features including remote access capabilities, cloud backup and the ability to share and stream content. The drive is available in black, white and satin gold, and comes with a three-year long warranty. **Toshiba Canvio Connect II 3TB**

BUILT FOR PRECISION

The wallet-friendly LG Leon sports rear buttons, just like LG's flagship LG G3, and runs on a quad-core Qualcomm Snapdragon 400 processor with 1GB RAM. In addition, the 4.5-inch smartphone boasts a number of features previously only available in LG's premium smartphones such as intuitive UX, in-cell touch display, and Gesture Shot. **LG Leon LTE**

COMPACT INSTALLATION

The LCOS-based Canon XEED WUX500 sports 5,000 lumens of brightness, a 2000:1 contrast ratio and a WUXGA (1,920 x 1,200) resolution. It's also the company's first projector to be equipped with an HDBaseT receiver, which enables uncompressed HD video, audio, and serial control signals to be transmitted via a single Ethernet cable. Connectivity-wise, it supports HDMI, DVI-I, USB, RJ-45, Wi-Fi, and RS-232C. **Canon XEED WUX500**

A SPEEDY SAVAGE

The HyperX Savage is a flagship 2.5-inch SATA 6Gbps SSD. It utilizes Phison's flagship quad-core, eight-channel PS3110-S10 controller and claims sequential read and write speeds of up to 560MB/s and 530MB/s respectively. As a Savage-branded product, the HyperX Savage SSD sports a bold red steel and aluminium case that sets it apart from other products in the HyperX line. Power users can look forward to more responsive systems and quicker loading times with the new Savage. **Kingston HyperX Savage SSD**

UNLEASH YOUR ROUTER'S POTENTIAL

AC2400 class routers are the fastest available, but to take advantage of their high speeds requires a compatible client such as the new ASUS EA-AC87. The EA-AC87 is one of the first 4x4 802.11ac Wave 2 compatible clients to hit the market and supports a maximum data transfer rare of 1,734Mbps, allowing users to maximize the potential of their AC2400 class router. **ASUS EA-AC87 5GHz Wireless-AC 1800 Media Bridge/ Access Point**

A PROFESSIONAL-GRADE STUDIO MICROPHONE

The Razer Seiren Pro improves on last year's Seiren with professional features. It includes a high-pass filter to remove low-end ambient noise so your voice is clearer and comes with an analog XLR option that allows you to plug the microphone directly into mixing boards and cameras, or even string together multiple microphones to the same mixing board. It also sports three 14mm custom-tuned condenser capsules capable of four different recording pattern configurations that can record up to an impressive 192kHz/24-bit resolution. **Razer Seiren Pro**

WIRELESS CHARGING ON YOUR DASHBOARD

If you are always on the move, it can be difficult to find the right opportunity to charge your phone. Well, the VU Wireless Charging Car Mount can help with that. Its micro-gel suction cup fastens securely to windshields, dashboards and solid surfaces, giving you greater freedom in choosing how you want to set it up. It supports the Qi wireless charging standard and should support devices all the way up to 6-inches. **TYLT VU Wireless Charging Car Mount**

NOISE NO MORE

The Philips Fidelio NC1 is the first in the range to provide Active Noise Cancelling technology, and it uses four microphones to detect ambient noise before inverting the signal, thus cancelling out the offending frequencies. Designed with travelers in mind, the Fidelio NC1 sports memory foam ear pads and a battery that lasts a good 30 hours, making suitable for even the longest of journeys. **Philips Fidelio NC1**

A HANDY TRAVEL COMPANION

The TEW-817DTR travel router lets users easily and securely share a single internet connection. In router mode, it turns a wired internet connection into a shared wireless network; and in WISP mode, it shares a single password protected WISP-compatible hotel WiFi connection with multiple users. Additionally, it's dual-band capable and supports 802.11ac up to 433Mbps and 802.11n up to 300Mbps. **Trendnet TEW-817DTR AC750 Wireless Travel Router**

ULTRA AFFORDABLE DUAL-SIM

The Lumia 430 is an ultra-affordable $119 4-inch Windows Phone 8.1 smartphone powered by a Qualcomm Snapdragon 200 1.2GHz dual-core processor. It will be upgradeable to Windows 10 and comes with Microsoft Office, Skype and OneDrive pre-loaded. **Microsoft Lumia 430**

CRÈME DE LA CRÈME

Not all G-Shocks are made the same. The MRG-G1000 is by far Casio most refined tough timepiece. Each piece is crafted to perfection by a master craftsman and built with ultra-lightweight titanium that's further treated for durability, sallaz polishing, and anti-reflective sapphire crystal glass. It's solar powered and features hybrid atomic and gps time adjustment. Take my money now!
Casio G-SHOCK MRG-G1000

MULTI-GOODNESS

The Nikon COOLPIX L840 is perfect for users looking for a powerful multi-functional superzoom camera. It features an impressive 38x optical zoom or up to 76x with Dynamic Fine Zoom technology. It's a capable shooter with its 16.0-megapixel, backside-illuminated (BSI) CMOS sensor and high sensitivity (ISO 6400). Plus, you get cool, fancy features such as a short movie function, 18 pre-set scene modes and the evolved smart portrait mode.
Nikon COOLPIX L840

AT YOUR FINGERTIPS

Looking to drown out all distractions while you work out in the gym? Try a pair of OCX 686G Sports by Sennheiser. SteriTouch anti-bacterial ear adapters allow you to easily get a perfect fit, while the flexible earhook securing mechanism ensures that the headphones sit comfortably on your ears throughout your workout. **Sennheiser OCX 686G Sports**

MASTER THE SELFIE

The Sony Xperia C4 is ideal for selfies with its 5-megapixel, 25mm wide angle lens front camera and Full HD 5.5-inch display. The smartphone also has a 13MP rear camera and is armed with Sony's SteadyShot image stabilization technology. **Sony Xperia C4**

CARPLAY ARRIVES

If you drive and use an Apple iPhone, you would happy to know that Pioneer's latest AVH-8750BT will enable you to have Apple CarPlay in your car. CarPlay will allow users to take and make calls, send and receive message, as well as get directions, without taking their hands off the wheels. It also supports Pioneer's own AppRadio mode, so Android users can also use their devices on-the-go. Audiophiles will also be happy to know that the AVH-8750BT supports FLAC up to 24-bit 192kHz. **Pioneer AVH-8750BT**

MIXING IT UP

Olympus awesome PEN E-PL7 is getting an equally awesome customization service. Available exclusively at www. shopatolympus.com.sg, this service allows you to customise your PEN E-PL7 camera to suit your personal style and taste. Collaborating with brands like Jill-E, Cath Kidston and Ciesta, Olympus is giving you a chance to mix things up with a wide variety of colors and prints for the camera skin, lens, straps, pouches and bags. **Olympus PEN E-PL7 Camera Customization Service**

3D CAMERA ON A TABLET?

Dell claims that the Venue 8 7000 is the world's thinnest tablet and we have no doubts about that claim. It's just 6 mm thick. The more impressive thing is that it packs in Intel's new RealSense 3D cameras which allows you to take pictures on your tablet to a whole new level. **Dell Venue 8 7000**

DESKTOP PORTABILITY

A casual look at the W-15 and you'd think that it's a normal gaming notebook. What you don't see is that under its chassis, the W-15 packs an Intel Core i7-4790K (4GHz, 8MB cache) that is perfect for overclocking. So while the rest of the specs may be that of a top of the line notebook, don't underestimate the raw computing power of the W-15. **Aftershock W-15**

LIGHTNING-FAST STORAGE

AMD fans rejoice, NVM Express (NVMe) support has finally arrived on AMD motherboards. The MSI 990FXA Gaming AM3+ motherboard allows users to enjoy the best in storage technology and performance when paired with devices like the Intel 750 series PCIe SSDs. The 990FXA Gaming also comes with two onboard USB 3.1 Type-A ports for lightning-fast transfers. And like any MSI Gaming series board, it is crammed chock full of quality components like solid capacitors and chokes. **MSI 990FXA Gaming**

LESS IS MORE

If you don't like putting up with bulky pockets, the Mujjo Leather Wallet Case 80° for iPhone 6 and 6 Plus could very well be just the solution for you. Made of high quality vegetable-tanned leather, it is designed with an 80-degree slant pocket so your cash and cards fit snugly in an upward angle to prevent them from slipping out. The leather wallet case can hold up to 2 to 3 cards without sacrificing the case's slender silhouette. **Mujjo Leather Wallet Case**

THE MMMs OF PLEASURE

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ROBOTS ARE COMING

Robotics technology has reached a stage where fiction is turning into reality. As we now live in a world where cars can drive themselves and you can have your meals expertly prepared by a robot chef, what are the implications of chasing the elusive goal of true artificial intelligence?

Text by *Zachary Chan*

MORE INSIDE>

PRINT EVERYTHING

3D printing is the next big thing but as cheap consumer printers become available, questions arise about IP rights, indemnity and quality control.

PC TECH UPDATES

The PC isn't dead. In fact, from what we saw at Computex 2015, both desktop and notebook users are in for a treat with powerful new chips for every budget.

DOMESTICATING TECHNOLOGY

Living with robots and the dilemma of realizing true A.I.

by *Zachary Chan*

Industry analysts predict that robotics will be the next revolution and will one day be as ubiquitous as the internet or and the PC. The question however, isn't whether this will happen, it will, but in what form.

When I attended the inaugural CES Asia 2015 in Shanghai last May, I was fortunate enough to sit in a very interesting panel discussion about robotics that didn't so much as talk about technology and innovation, but the cultural and empathic implications that robotics and A.I. bring to the table.

The difference between a robot and a smart device, according to the panel which consisted of speakers from Intel and AiNemo, a Chinese robotics startup, is that robots are autonomous, with the ability to move or perform their intended tasks without further input from a human user.

Outside of their mass adoption in production and manufacturing, robots are developed as companions such as the Sony Aibo and as household help such as autonomous vacuum cleaners. CES Asia was also the stage for the public debut of the world's first robotic kitchen from Moley Robotics UK, which features two fully articulated robotic arms and an iTunes-like library of recipes. The Moley robot isn't just able to follow a recipe, but can supposedly mimic the flair and dexterity of a human chef while preparing said dishes.

In China, one area of growth is in telemedicine and patient care, where robots are used to ensure patients have a constant connection with family and healthcare services in case of emergencies where they might not be physically able to get help. If you're picturing robots such as EVE from Wall-E or Baymax from Big Hero 6, we're still far off from that reality. Many household 'robots' such as the aforementioned AiNemo are more akin to connected webcams with limited mobility.

Still, it is fair to say that we've become used to robotics in our lives and in fact welcome them as long as they remain tools. That's where it seems we draw the line. Robots are merely machines designed for a specific task. They might be the most advanced piece of hardware available, but they are still just tools. The moment we introduce intelligence into a robot is when we start to view it differently.

When the makers of the AiNemo robot started researching into the form and design of their robot, they found out that empathic values play a big role in the acceptance of a robot in the household. A Roomba for example, is free to zip around the house. But what if the Roomba could identify its owners, provide greetings and feedback? Not only do questions of security and privacy start to crop up, but it also seems to throw people off. Do you greet your robot back? Will you still treat it as a 'dumb' machine? Japan is probably the most forward in terms of experimenting with lifelike humanoid robots, though none have yet been able to bridge the uncanny valley.

Even as research into A.I. intensifies, more questions are being posed than the industry can answer. Take for instance the Moley robotic kitchen, you could possibly program it with safety features such as not pointing the sharp end of a knife in the proximity of a human, but how can it understand consequence? For example, a faulty sensor could result in leaving the gas turned on overnight, which would be deadly. Who is to blame then?

In the same vein, Asimov's laws of robotics would only work on simple machines. You cannot program a robot not to harm a human if it doesn't know what it means to harm one or more precisely, the ability to understand cause and effect, to make judgement calls to whether some harm may actually be required to avoid a greater hurt. What if you were trapped under rubble and the only way to extract you was to amputate your arm? Even if its A.I. was advanced enough to realize that a greater harm would befall you by leaving you in the rubble, would it know that it still couldn't just rip off your arm, which would effectively cause fatal blood loss and trauma?

All these decisions require true intelligence, something the level of A.I. today can only mimic. It may be able to learn new parameters, but can an A.I. ever apply reason, logic and emotion to its actions? The day may come when such an A.I. is realized, but even then, will it possibly know what it means to be human and empathize with us? I mean, we are fully self-aware are we not? But do we know what it means to be a chimpanzee for example? We cannot.

This scenario is masterfully explored in the film Ex Machina, where the robot Ava may have achieved consciousness, but still cannot comprehend the intricacies or fragility of human life. In light of this, should we even continue exploring the A.I. route, or should machines always be under the control of humans?

> "You cannot program a robot to not to harm a human if it doesn't know what it means to harm one or more precisely, the ability to understand cause and effect, to make judgement calls to whether some harm may actually be required to avoid a greater hurt."

PRINT ANYTHING

3D printing is set to solve all our problems, or condemn us all.

by *Zachary Chan*

For most people, 3D printing is nothing more than a cool gimmick. You get to print your own little plastic trinkets and it's all fun and games for a while, until it isn't. Unless you can actually print something useful—a replacement lightbulb or a shirt for example—then all you're really doing is creating more waste. And if you've been checking out the growing number of consumer-grade or personal 3D printers available, you'll also realize that the process is not only slow, but 3D printers today are limited to using one material at a time and the outcome can be rather crude, more akin to a carved candle than the epitome of engineering perfection.

However, there is a bigger picture to see here as the industry is quite bullish that 3D printing will be the next big thing, not just for you and me or even for commercial manufacturing, but as technology that will ultimately benefit all of mankind.

A little too grandiose a statement? Think about it for a moment.

In terms of bioscience and healthcare, 3D printing could be the solution that is able to drastically reduce waiting time for compatible organs, combat the black market and probably end pharmaceutical animal testing. In 2013, researchers in Princeton university produced a prototype of a "bionic" ear from an off the shelf 3D printer, merging electronics and cartilage materials. Researchers in Hangzhou DianZi university in China managed to bioprint a small working kidney that lasted four months. In 2014, researchers from Sydney and Harvard universities made a breakthrough in printing human tissue that was able to survive on its own after printing via a process called vascularization. The ultimate goal is of course to be able to print fully functional tissue and organs with wide ranging uses from more ethical medical testing to customized donor compatibility.

3D printing is also seeing rapid adoption in the classroom, where the technology is again seen as a complete solution to multiple problems in all levels of education. Even among primary students, 3D printing can help develop conceptualization and problem solving skills. In the US, an education initiative launched in November 2013 called the MakerBot Academy aims of putting a MakerBot Desktop 3D printer in every school in America. In Asia, Taiwan-based XYZprinting—the guys who produces the sub-US$500 da Vinci 3D printer—announced in April 2015 that they're in a deal to provide 3D printers across all 400,000 elementary schools in China over the next two years.

Hitting closer to home, 3D printing technologies are advancing at a pace that's parallel with traditional ink-on-paper printing. We're not just talking about improvements in speed and complexity. 3D printers capable of multi-color and multi-material printing could just be two to three years away.

However, before 3D printing can really go mainstream, scanning technology has to evolve first. Industry analysts are predicting another data explosion as the tools that enable scanning or capturing of depth information become commonplace. If you think about it, 3D cameras have been available for years and if you recently upgraded your PC or notebook this year, chances are you have an Intel RealSense 3D camera embedded in your system. Among the many things that a depth-sensing technology enables—such as measuring object distance or navigation and object avoidance in drones—spatial scanning is the key to 3D modelling.

And herein lies the next intellectual property debate: rampant physical piracy and erosion of brand value. Pretty soon, anyone with a camera would be able to capture accurate scans of just about any object, create a CAD model and then share, print or upload to the internet. Instead of movies and music, people will be downloading 3D models. Not only can anyone make perfect duplicates at home, but easily create derivative products too.

But let's leave that problem to the lawyers and lobbyists. What's more concerning is product indemnity and liability. What of users modifying their printer, using materials that aren't meant for it or printing a product outside of its technical specifications? Even if you accurately replicate a product 100% and it malfunctions and causes harm, who takes the blame? At the moment, the short answer is "use at your own risk, user beware."

Going back to the topic of medical bioprinting; for all its good intentions, there are also concerns of cell splicing or the merging of human and non-human cells. It would also be difficult to track artificially 3D-printed cells used in research and testing. If you think these problems are still far into the future, the scenarios above were actually raised in a 2013 Gartner report called "Predicts 2014: 3D Printing at the Inflection Point".

Then there are weapons. There have already been successful 3D printed, fully operational firearms. Imagine plastic DIY gun parts that are virtually undetectable via x-ray and can be disassembled and reassembled easily. There is currently a movement in the US to pass a bill that bans such untraceable 3D printed firearms call the Undetectable Firearms Modernization Act, but as of writing, it has yet to come to pass.

These are real risks when every home can potentially turn into its own manufacturing plant with no standards, no control and no tracking of products being made. Perhaps we should just stick with our single-color, plastic candle carvings for the time being.

> "In the fields of bioscience and healthcare, 3D printing could be the solution that is able to drastically reduce waiting time for compatible organs, combat the black market and probably end pharmaceutical animal testing."

PRINTING . . .

MID-YEAR TECH UPDATE: MOBILE PROCESSORS AND INTEGRATED GRAPHICS GET A BOOST

Smartwatches have been dubbed as the next big thing in technology, but the truth is we have seen very little innovation on that front.

by *Koh Wanzi*

Computex 2015 has come and gone, and we've been wowed by booths crammed with all manner of high-tech goodies. Believe it or not, Thermaltake actually showcased a PC case modeled after Mjölnir – the hammer of Thor – called Thermalthor (yes, really).

But outlandish form factors and gadgetry aside, most of us still spend most of our time in front of a fairly conventional desktop computer, laptop, or 2-in-1 hybrid. Nothing too fancy to see here, but that's really just skimming the surface.

Under the hood, Intel and AMD have announced a new range of desktop and mobile processors at Computex 2015 that promise improvements in performance, power efficiency and a range of new features. We take a look at the major announcements from both companies to bring you the gist of what you can expect in the desktop and mobile computing space moving forward.

"Intel's Computex announcement comprised a total of 10 desktop and mobile processors, all of which will feature the Intel Iris Pro Graphics 6200 integrated graphics processor (IGP)."

Broadwell packs a graphic punch

Broadwell was notoriously slow to release – so slow in fact that we are now nearing the cusp of the release of sixth-generation Skylake processors – but we finally have a view of the entire slate of Broadwell processors.

While Broadwell has already debuted in the form of select low-power chips like Intel Core M, Intel's Computex announcement comprised a total of 10 desktop and mobile processors, all of which will feature the Intel Iris Pro Graphics 6200 integrated graphics processor (IGP).

In fact, that's the most important takeaway from Intel's Computex announcement. All five desktop SKUs – even the LGA-based Intel Core i7-5775C and Core i5-5675C – have a TDP of 65 watts, and they're clearly not intended to replace Haswell's high-end desktop part, the Core i7-4790K. Improvements on the CPU front

are modest, and the new Iris Pro Graphics is the one boasting far more significant enhancements.

This makes sense when you consider that the new Broadwell chips are intended to improve performance in laptops and compact desktop form factors like mini PCs and AIOs. The new IGP promises to double the graphics performance of the Intel HD Graphics 4600 on the Core i7-4790K. According to Intel, it can run World of Warcraft at 1080p and 61fps, an ambitious claim which if true, marks a huge step forward in integrated graphics performance for Intel.

This is legitimately something to be excited about, and it also means that Intel has finally closed the gap with AMD's APUs in terms of integrated graphics performance. Laptop and small desktop manufacturers could make smaller, slimmer devices that can handle titles like League of Legends, Dota 2 and WoW, all without the need for a discrete graphics card. As a result, not only will we get sleeker and more powerful devices, they'll probably be cheaper too.

However, Broadwell will probably interest OEMs more than the enthusiast crowd. Existing LGA 1150 motherboards may be compatible with Broadwell, but owners of Haswell chips probably already have a discrete GPU in their system, which would leave little incentive to upgrade. So unless you're in the market for a notebook or AIO system, it looks like Skylake is the upgrade to watch out for!

AMD Kaveri gets an upgrade to Godavari
Elsewhere in the desktop space, AMD delivered an incremental update to its Kaveri APU in the form of Godavari. While the AMD A10-7870K will replace the A10-7850K, both chips are actually based on the same Steamroller cores and architecture.

As of now, the A10-7870K is the sole representative of the Godavari family, but AMD will slowly roll out other Godavari APUs in the coming months. AMD is aiming for evolution rather than revolution with Godavari – it is taking advantage of process maturity and a better binning process to squeeze more performance from an existing architecture. Talk about maximizing your resources!

In addition to higher CPU base and boost frequencies, GPU frequencies were also kicked up a notch. A faster APU should also be more power-hungry, but Godavari brings improved power and performance management schemes and a better thermal interface to cope with it.

If you're looking to build an affordable desktop or HTPC for light gaming, Godavari might appeal to you. But by light gaming, we don't mean Minecraft. AMD took care to emphasize the A10-7870K's performance in some of the most popular online multi-player games today, citing 62fps in Counter-Strike: Global Offensive.

Intel's Iris Pro Graphics 6200 may be more powerful, but the A10-7870K definitely has a more attractive price-to-performance ratio at US$137. Budget system builders, look this way!

Excavating the mainstream notebook market with Carrizo
Finally, a new architecture from AMD. Carrizo features an all-new Excavator core that is highly optimized for power efficiency and streamlined for better power control. But here's the important part: Carrizo will only be targeting the

> "Finally, a new architecture from AMD. Carrizo features an all-new Excavator core that is highly optimized for power efficiency and streamlined for better power control."
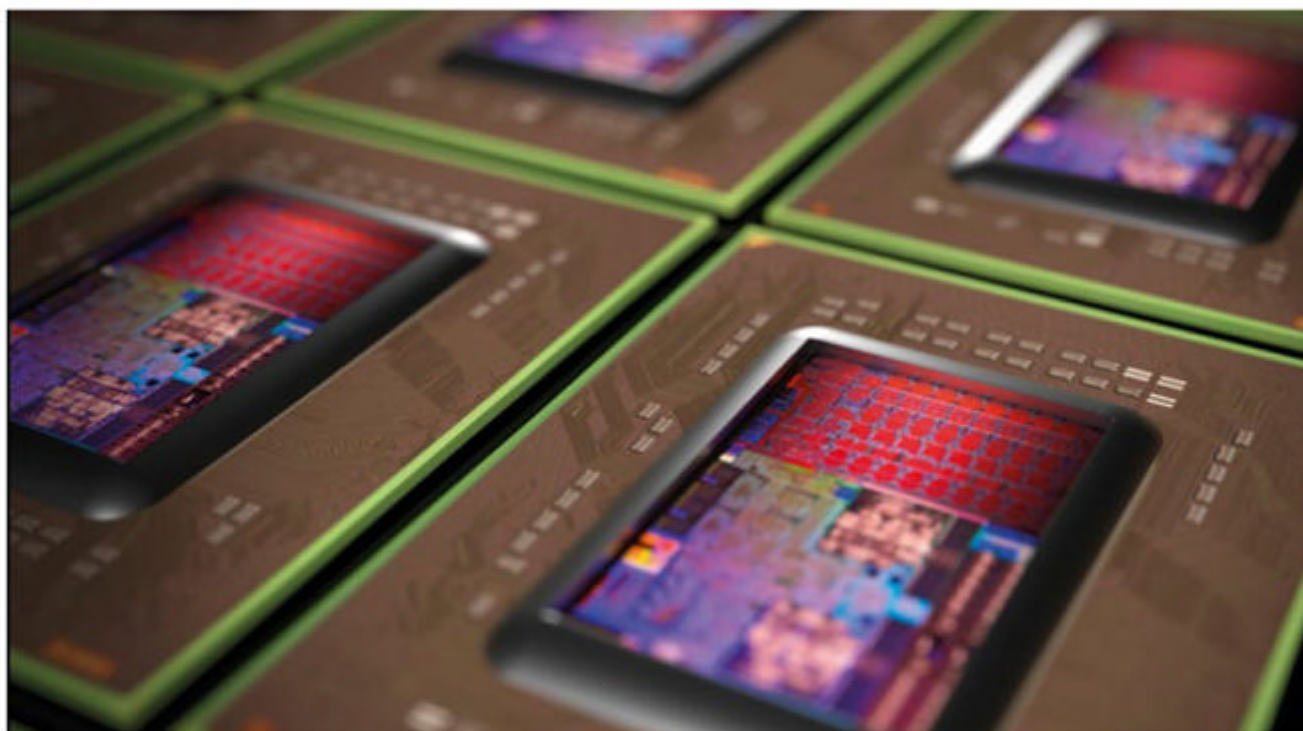
notebook market, at least at first. This does mean that only laptop OEMs will be able to get their hands on the chips for now.

Although the graphics performance of AMD's APUs has always been their strong suit, AMD will not be going after the high-end gaming notebook market. Instead, it wants to target the mainstream – and also much larger – notebook segment.

The best part of it all? Carrizo is now officially an SoC, with all Southbridge chipset functionality now on-die with the APU. Notebook users care about general improvements to user experience and battery life, and Carrizo delivers snappier, more efficient performance and lower power draw.

Furthermore, it does this without moving on to a smaller process node or even increasing the die size (it actually shrinks it). This is all thanks to the new Excavator core, which also allows more efficient HEVC decoding and smooth 4K video playback.

Other usability improvements include Looking Glass and Gesture Control. Looking Glass attaches useful tags to your photo and video library and can even recognize the faces of the people in them, while Gesture Control takes on Intel's RealSense 3D camera by allowing laptop webcams to interpret gestures.

If this sounds good, that's because it is. Major vendors like HP are already on board, and mainstream notebooks could gain beefier multimedia capabilities at extremely attractive prices.

What's next?
But of course, the tech world never stands still. When all the whirlwind announcements of Computex are done with, we're already looking ahead to the next big thing over the horizon. In the computing and gaming space, we've got our sights set on Intel's Skylake processors and DirectX 12.

Skylake will be Intel's biggest

announcement of the year. It will feature a brand new microarchitecture and a comprehensive refresh of the Core line-up, complete with the high-end, performance desktop chips that Broadwell lacked.

On the software front, both Intel and AMD are gearing up for support of the next-generation DirectX 12 API, which will enable greater access to graphics hardware for developers, better utilization of multi-core CPUs and a range of new features for more realistic graphics.

However, one of the more interesting features by far is Explicit Asynchronous Multi-GPU, which dispenses with the old rules of what's possible with multi-GPU setups. Long story short: you can now combine AMD and NVIDIA cards and even capitalize on your processor's integrated graphics, which certainly bodes well for the current slate of beefed-up graphics on Intel's processors and AMD's APUs.

Excited? We certainly are.
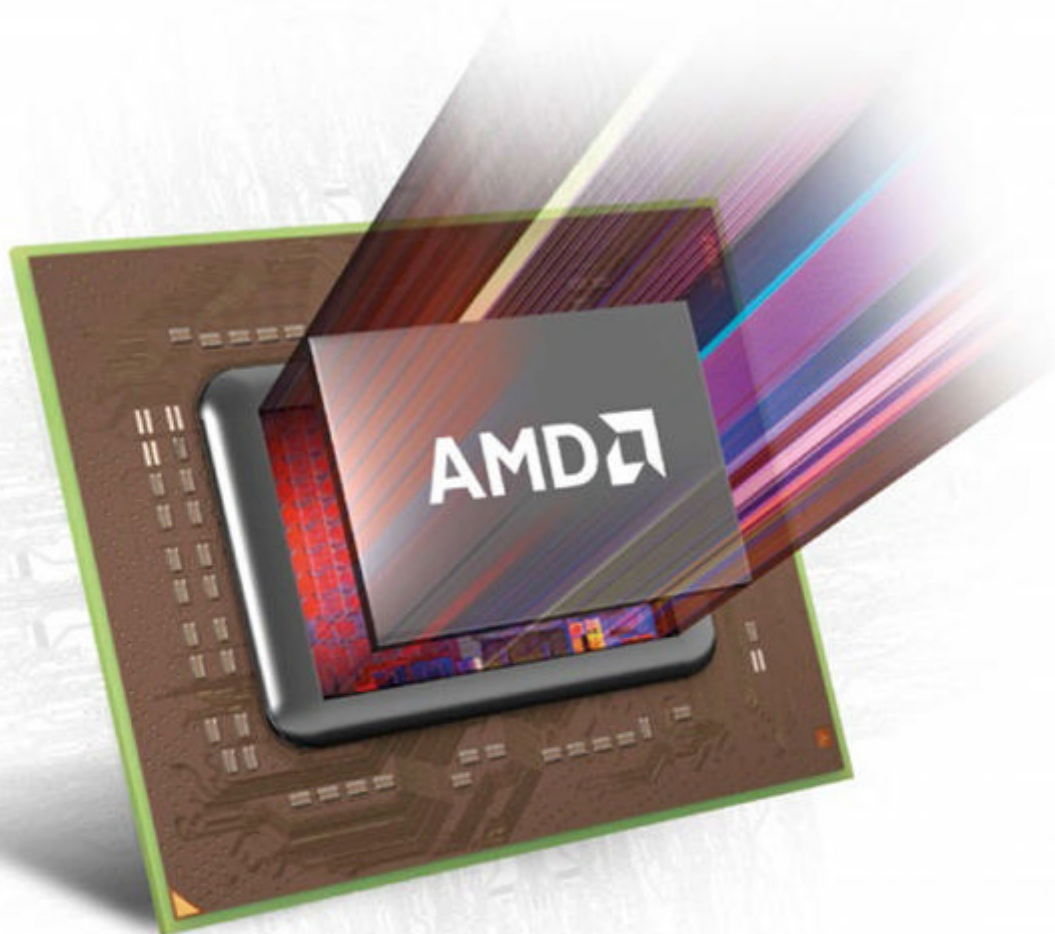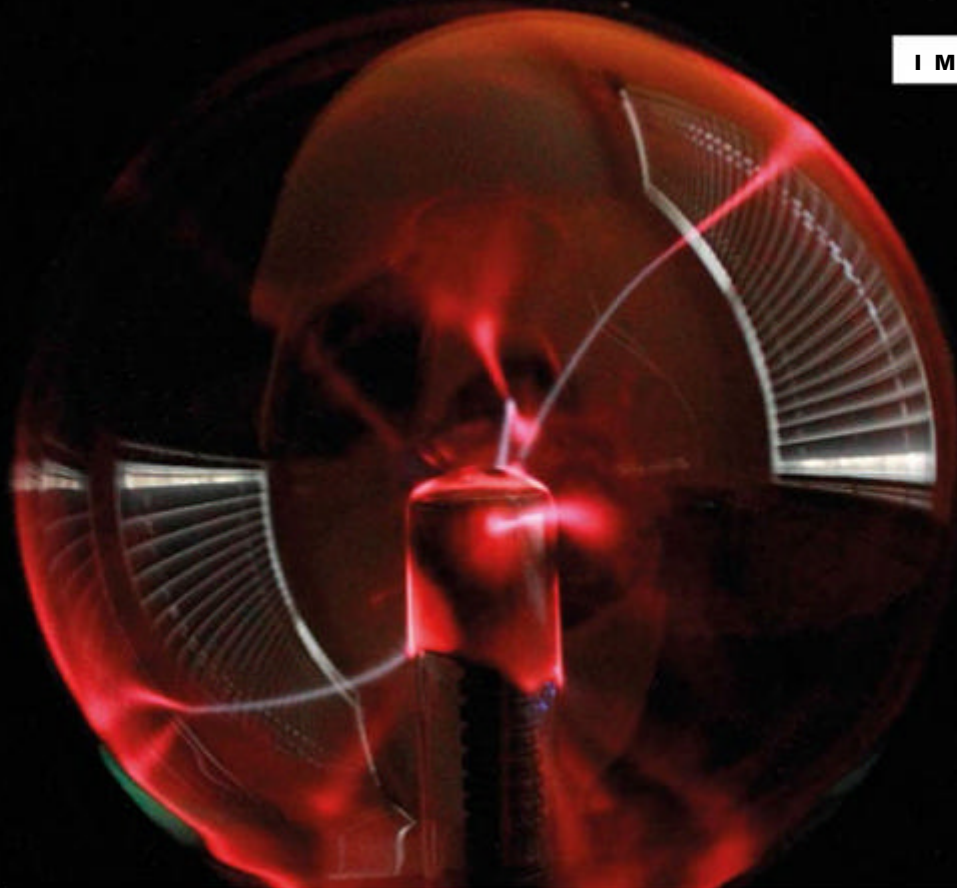
LONG-RANGE IRIS SCANNING HAS ARRIVED

by *Koh Wanzi*

Biometric scanning is usually overt. You walk up to a scanner and your fingerprint or iris is committed to a database or authenticated to grant you access to a certain locale or device. But if researchers at Carnegie Mellon University's CyLab Biometrics Center have their way, that's all about to change.

They have developed an iris recognition system that can identify someone from as far as 12m away. Like fingerprint and facial recognition systems, CyLab's technology uses mathematical pattern-recognition techniques. High-resolution cameras are used to capture the images of the iris from a distance using light in the near-infrared wavelength band.

While it's almost impossible to scan someone's iris now without their cooperation, this technology would allow people to have their irises scanned without their knowledge. One obvious application for this technology would be in law enforcement, where a suspect could be identified at long range and under various lighting conditions. It is even capable of identifying someone as they glance into the rear- or side-view mirror of their car, which would help police officers recognize dangerous suspects before they even exit their vehicle.

The technology's main selling point is that it's less intrusive, which could make its use in civilian settings much more amenable and quicker. Gone are the days where you'll need to step right up to a machine and lean in close, because CyLab's scanner can capture someone's iris and face as they walk by.

Despite the obvious privacy implications, Carnegie Mellon researchers believe the scanner could potentially replace government IDs at airports and elsewhere. In fact, one Carnegie Mellon engineering professor, Marios Savvides, has a far loftier goal in mind for the technology. He thinks it could help stop human and sex trafficking if it was put in place at national borders.

The team has already secured a patent for the invention and is working to make it easier and cheaper. Seraphim Global, a US-based non-profit which works to stop trafficking, is also working with Savvides to explore the technology's potential.

Challenging Apple and Samsung

RICHARD YU
CEO OF HUAWEI TECHNOLOGIES CONSUMER BUSINESS GROUP

by *James Lu*

Huawei started off as an infrastructure and networking company, how did you make the switch to a consumer business?
We started our consumer business ten years ago when our network carrier partners requested us to develop cost effective handsets for them. But we felt that cannot continue to develop low cost phones, because it will negatively influence user experience, so four years ago we stopped focusing on low cost and moved to middle and high tier phones, so we can deliver better quality and better user experience. Now we've become the number three smartphone supplier in the world, and we're quickly closing the gap to Samsung and Apple, so maybe in the future we can be number two or number one. Last year we shipped 75 million phones. This year we will ship more than 100 million units. In three or four years, maybe we can increase our volume to over 300 million.

How much of your market share comes from China shipments?
China accounts for about half of our shipments. But outside China, we are just beginning. In this region, we're just getting started. In the past, our guys didn't know how to do the consumer business at all. We are just learning how to do that.

What do you think of the current state of the smartphone industry?
This industry is very competitive, so more and more companies are disappearing. Apple and Samsung are dominant right now, but Huawei is the only one with quick growth. Most of the other smartphone vendors will disappear in the next three to five years. Maybe only three can survive globally. Even in the Chinese market, Chinese smartphone suppliers will disappear. It's not polite for me to speak their name, but you know they'll be quickly disappearing.

What challenges does Huawei face in the smartphone industry?
Challenges? Actually we are the challengers. We are the challengers to Apple and Samsung. We don't worry about all the others. All the others are very weak. They're not strong at all. The only two strong ones are Apple and Samsung, and we are the challengers to them. Maybe I'm not humble, but I say that all of the rest are not on the same level as us, they are totally not the same.

But brands like Xiaomi have recently seen a lot of success in Singapore with low cost, high value devices. Are you not worried about them?
We don't worry about them. Singapore is a high-end market. People here don't just care about low cost. People here care about brand, leadership and design. So I do believe that in this market, people will care more about the brand and the value, not just low cost and low price. Even in China, we are the leader. For the high-end market, Huawei sells much more than all of the other Chinese brands. We are the only vendor that can sell high-end devices in the China market. They cannot sell high-end, they can only sell low end, they cannot move into mid or high tier. Xiaomi cannot sell high-end very well. It will not work. That is the fact. Huawei's high end phones are much better. If you look at the sales, we do much better. Consumers make the choice. Just because you claim you are the leading or the best, it doesn't mean that you are - the consumer will recognize who is the best.

What do you want consumers to think of Huawei?
We want to be known for leading at innovation and technology. Our brand slogan for our consumer business is "Make it possible." We want to bring better products and solutions to consumers and to build ourselves up as the consumer product supplier in the industry. We want people to know that our quality and service is better than our competitors.

Huawei uses both its own in-house chipsets, as well as those from Qualcomm. How do you decide which to use?
Some products we use Qualcomm, some products we use Huawei. For the Huawei P8, based on the competition, we selected Huawei's chipset because we feel that it is better for high-end products.

I was surprised that the P8 uses a three-year-old ARM Mali-T628 MP4 GPU. Any insight into why you chose an older GPU?
Our analysis shows that that GPU is good enough for that display size and its Full HD resolution. Later this year, we will be launching a new processor with a much more powerful, dramatically improved GPU designed for 2k and 4k resolution. But currently, for a small 5.2inch screen with Full HD resolution it's good enough for your eyes. It's not necessary to use a higher end GPU.

What about for gaming?
Even for Intensive gaming, it's good enough. It has all the performance required for gaming.

How is Huawei working to overcome its image as a China brand?
if we look at the latest technology brands such as Apple smartphones and watches, they are all made in china. I believe China will become an anchor name for high quality products in future, and I believe Huawei will win the recognition of consumers around the world. In the past, in Europe, people cannot accept China brands, but now, more and more people can accept that Huawei means high technology, leading, better quality, better user experience. Everything is changing.

" Apple and Samsung are dominant right now, but Huawei is the only one with quick growth. Most of the other smartphone vendors will disappear in the next three to five years. **"**

"

3D printing will easily overtake the current way of capturing a memory of a person.

"

From snap to print

EMILE TAN PRODUCER, WISHING WELL (THE IMAGING STATION)

by *Marcus Wong*

MAKEUP JOEL GWEE USING GUERLAIN AND REDKEN FOR HAIR PHOTOGRAPHY LEE YEE CHIN ART DIRECTION KEN KOH

Why the move into 3D printing?

It is something that's relatively new, but we see a market for it. With this particular set-up we can get a 3D model of a particular person relatively quick compared to starting from scratch or buying stock models that may not work for us. This serves us not only as a service we can offer to the public, but also to complement our existing commercial work as well. And what sort of services is the general public asking for?

More of couples wanting a memory of themselves that they can keep forever? I do get a lot of requests from families, people who want to be captured with their pets. We get a lot of requests to do prints of families for remembrance, so instead of a still photo you get full 3D, and these are printable to scale.

Life-size?

No, not life-sized, but definitely to scale.

I see. So how do your photographic techniques and knowledge apply in 3D printing?

Interesting question, because the techniques were used during the initial set-up to determine how many cameras were needed, what focal length to best use, how to sort out the lighting. For 3D printing we need to have flat lighting – almost zero lighting – and no shadows. And that's the tricky part, so knowledge of your focal lengths, your settings to shoot, all played a part, and our in-house photographer helped us to do the initial set-up. I would say you do need to know your cameras, so it's not just about buying the biggest camera out there, but knowing what you need for the purpose.

From what I see your set-up involves a full rig of cameras as opposed to creating a 3D model in computer. Did you try that before?

We did. We created characters and printed them out, but it is costly to do it that way as it takes a lot of man-hours to create a detailed 3D model from scratch. With our set-up, one click and I can just piece them together with software, and I've got a 3D model of a person.

How did you come up with this system?

So, the traditional way of scanning a person was a hand-scan technique. We tried it, but it won't work because you need to stand still for twenty minutes. Any movement means you have to rescan. I myself tried it and I couldn't take it. It's too time consuming, you can't move, it's not sharp, and it's a waste because the printer can print very good details, but the scanner just won't allow it.

With the traditional way there's no way you can do pets and babies or people with physical disabilities. So we researched further to see how we could go one-up, and we thought: DSLRs. What if we could put a lot of cameras around a person, creating a 2D image, then we stitch the 2D image to create a 3D image? That's how we came up with the 360 shot.

What was the most complex part of developing the process?

Everything was a mystery to us. Nikon loaned us five cameras to play with but we were in the grey of how this was going to work out. We could visualize where we wanted to go, but we didn't know how to get to that point. So we made one pole with five cameras, and got people to stand on a turntable. Instead of the entire rig we had now, we got one person to stand on the turntable, take a shot with the one pole, shoot, rotate the person, shoot, rotate. Then we stitched.

It didn't work perfectly, but we found out that this worked and that we could actually take it further. So we took more cameras and set up the rig.

How many cameras? How do we sync the cameras? Are our batteries fast enough? Because our power source is alternating current, what if we hit it at the wrong pulse and the cameras don't fire? Lucky for us, we haven't had that problem with our current set-up.

What's the biggest advantage of 3D printing?

I'd say the whole figure (of you) comes to life. It's something more tangible than a photo; and you get more memories from that. 3D printing will easily overtake the current way of capturing a memory of a person. I think it definitely is a trend that will be picked up in the region, but we don't see it as something everyone will want, but more of people who know how to appreciate it.

HEALTH AND FITNESS: GAME ON WITH TECH

Beyond social communication and entertainment, technology is now changing the world of personal health and fitness.

Text by *Marcus Wong* Art Direction *Ken Koh*

TECHNOLOGY TO TRACK YOU

Wearable fitness trackers represent the first step to keeping tabs on every aspect of your daily activity. Be it the foods you've consumed or the number of steps taken for the day, all this data can be easily transferred to an app on your smartphone for easy tracking, and later accessed at any time of the day to help with your planning.

Trackers like these either use an integrated GPS system or pulls the information off your smartphone to track your pace, distance and altitude, thus being able to track your activity when running or cycling for example.

The more advanced trackers even work with heart rate sensors to assess the intensity of your workout, giving you real-time feedback on just how much harder you need to work to achieve your fitness goals.

Take for example the Polar M400, a sport watch that comes with GPS capabilities. You can pair it with an additional heart rate sensor as well as a Bluetooth Stridesensor to get an accurate measure of how hard you're working and feedback on how long each stride you take is. The Stridesensor can even provide real-time feedback on your running cadence, thus allowing you to adjust your technique as you go.

The heart rate sensor straps around your chest and measures the electric signal of your heart just as an electrocardiogram (ECG) would. This then gives a timing reference for each heart beat to the Polar M400, allowing it to calculate the beats per minute your heart is working at, which in turn tells it your body's exertion level in real-time. The harder you exercise, the higher your oxygen consumption, and hence the higher your heart rate.

All this information can be easily fed into your smartphone to be used in conjunction with a calorie counter app to easily manage your fitness and nutrition schedule. As they say, information is power, and having all the numbers literally at your fingertips will allow you to easily make decisions like how many sets of exercise to do for that mid-afternoon workout or how much of a particular food group you can allow yourself for the day. Being able to track and analyze your progress is almost like having a personal fitness coach in your pocket!

Where do the numbers come from?

In general, wrist-based fitness trackers rely on five main types of sensors to get their information: a heart rate monitor, an accelerometer, a GPS, a galvanic skin response sensor, and a thermometer, to get the information that's being used to measure your workout.

If your wrist-based fitness tracker boasts a heart rate monitor, it's likely to be an optical one, and uses photoplethysmography to measure your heart rate. This basically means it shines LED light through your skin and examines the amount that is reflected back. Because blood absorbs more light, the amount that comes back between beats is less, thus giving your tracker an indication of your heart rate.

The accelerometer is the most common type of sensor found in fitness trackers, and are basically used to determine if your unit is moving or not, how fast, and if they are horizontal or vertical. Based on where your device is worn, this lets the tracker read the movement from that part, and hence gives it an approximation of what you're currently doing.

GPS or global positioning system isn't new, but what is changing for them with wearables is that they are becoming more energy efficient. These will basically give a more accurate reading of where you are and so can give you a way to map how far you've run/cycled and your elevation based on GPS data of your location.

A galvanic skin response sensor measures electrical conductivity of your skin. Basically, it detects when you start to sweat and so lets your fitness tracker more accurately determine when you're starting to exercise and how hard you're pushing yourself.

A thermometer obviously measures temperature, but you'll be interested to know that your fitness band can use information about an increase in skin temperature (or lack of) to detect how your body is responding to the physical activity you're putting it under.

The ASICS Foot ID system involves dynamic component requiring you to take a short run on a treadmill to allow for an analysis of your running gait.

TECHNOLOGY TO ENHANCE YOU

Technology has also advanced to a point where the average person has access to tools that were once only available to professional athletes. Beyond simple pedometers and GPS trackers, tech can do everything from making sure you begin your exercise right to post-workout muscle recovery.

Take the Asics Foot ID system for example. There are two components to the system – a static Foot ID component that does a three-dimensional scan of your feet to derive precise measurements for obtaining the perfect type of "fit" your foot requires. Besides being used to recommend the best shoe, the system is also able to pick up on things like your arch height and heel angle, both of which affect the type of padding you require. This helps to prevent injury while exercising and allows you to continue running longer.

The dynamic Foot ID component on the other hand, involves using a high-performance camera to record your running

MORE THAN JUST FINDING THE BEST FIT, YOU CAN NOW ANALYZE GAIT AND POSTURE DIRECTLY IN A SHOE STORE, WITH IN-DEPTH INFORMATION TO HELP YOU EXERCISE BETTER AND PREVENT INJURY.

movement on a treadmill. This allows Asics specialists to identify your running gait and offer personalized recommendations. This is done by recording the entire motion and then freezing playback for analysis of things like heel-to-toe rotation and the splay of your feet. The specialist can then give you feedback on things like muscle imbalances between your feet based on your running tendencies.

This information then allows you to undertake a program that specifically targets those deficiencies, making you stronger in the long run. More importantly, the corrective training will help to reduce your chances of injury, which allows you to enjoy sports for longer.

There are also sports-specific devices like the iMeasure U device and the Divesprt headset, which focus on mechanics in your sport. The iMeasure U is sewn into your swimming costume to provide live feedback on your arm strokes and kicks by measuring the load that's placed on the small of your back with every kick and stroke. Feeding that into its companion app lets your smartphone interpret the data

Sample Measurement Parameters:

| Foot length | Ball girth | Heel width | Initial contact | Foot flat phase | Propulsion phase |
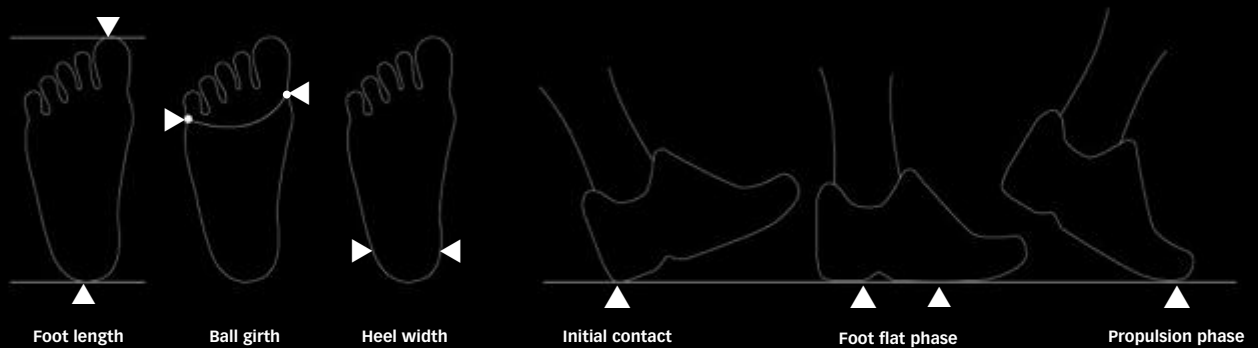
which is then stored for later analysis.

The Divesprt headset is currently used in American football where they employ the VR device to choose from a selection of plays. Players can experience how it unfolds from a first person perspective, which in theory will help ingrain those plays or strategies into muscle memory better than just seeing them on screen, allowing them to react faster during the actual game.

Then you have products like the PowerDot, which is an extremely portable electrical muscle stimulator that can help in resistance building and muscle recovery. You can target very specific muscle groups with various pre-programmed routines and the whole thing is controlled wirelessly via an app on your smartphone. The best part is that it's small enough to be used undetected under your clothes.

TECHNOLOGY ENABLES US TO HAVE EASY ACCESS TO WIRELESS, PORTABLE MUSCLE RESISTANCE BUILDING AND RECOVERY STIMULATORS LIKE THE POWERDOT.
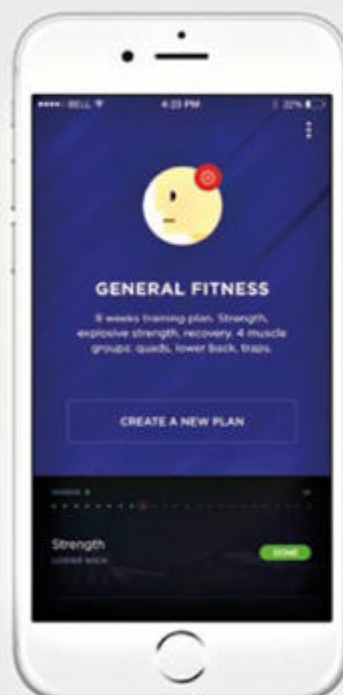
TECHNOLOGY TO PROFILE YOU

Just as everything these days seems to be feeding data into our smartphones, so too are the major device makers taking notice. Apple for one, has launched their Health app, which builds on the HealthKit framework to allow your smart phone to aggregate all the information from your health and fitness apps in one place.

This makes it very easy to track all your activity as you can get an immediate overview of things like calories burnt, heart rate over time, and you can even fill a card with your basic health information like medical allergies, pre-existing conditions and emergency contacts that can be accessible from your lock screen - just in case.

Apple has built another service called ResearchKit into the HealthKit which allows developers to easily build in applications that collect and aggregate data for research purposes. For example, an app that gathers data about air quality in a certain area can have that information matched with data from another app that gathers the breathing conditions of asthma sufferers in the same area to see how much of a correlation exists between the two factors. Thus, giving you a picture of the factors that may affect your health overall.

On the Android front, Google Fit looks to do much the same, providing a comprehensive view of your fitness by consolidating all the data from compatible health apps on your phone into one single app.

The main differences lie in the range of datasets captured. Whereas Google Fit seems to concentrate more on fitness, with official data types ranging from activity types and times,

TECHNOLOGY HAS ADVANCED TO THE POINT WHERE WE CAN NOW ACCESS MUSCLE RECOVERY STIMULATORS THAT WERE ONCE ONLY AVAILABLE TO PROFESSIONAL ATHLETES IN THE COMFORT OF OUR HOMES.

Changing the viewing experience

Besides changing the way we exercise, improvements in technology are also changing the way we enjoy viewing sports. For example, the NBA has been looking to provide a courtside experience to all of their fans by partnering with Samsung to provide 360-degree immersive video.

In an early experiment, the 64th All-Star Game, Foot Locker Three-point shooting Contest, Sprite Slam Dunk and Slam Dunk Practice were filmed by multiple cameras courtside with the footage put online, accessible via the Milk VR app.

Fans with the Samsung Gear VR Innovator Edition and a Samsung Galaxy Note 4 could then tap into the footage and be transported courtside with a full 360-degree view of what's happening from your "seat". Simply strap the set on, and start up to footage and you'll be transported to the arena; stationary, but able to look around as you wish

Turn your head sideways and you'll see the graph cal scoreboard, look up and you'll see the ceiling lights, down and you'll see the flooring of the arena.

It's almost as good as being physically there, and in the case of the Foot Locker Three-point shooting Contest, you'll even have a chance to get an inside look at how the participants warm up. It's an incredible application of technology, and is probably the best way to bring the game closer to fans all over the world.

Above: Apple's new Health app draws on all HealthKit-compatible apps to offer an overall holistic view of your health.
Below: Google Fit isn't as integrated as Apple's HealthKit, but it is also a one-stop location for collecting and analyzing fitness tracking data.

calories burnt to steps taken and elevation, Apple's HealthKit seems to be looking at a more wholistic view of health with fields for gender, sleep patterns, blood type and even allergies.

Also different, is the delivery. Google Fit takes the form of a separate app download and a web-based portal from which data can be drawn from a wide range of devices (and apps). Like other fitness apps, the Google Fit app itself already has capabilities to tap on the sensor in your device, and so can detect running, walking and cycling.

HealthKit on the other hand, is built right into iOS 8 and gives you access to data via the Health app. That in turn, uses the motion co-processors to collect sensor data from the internal accelerometers, gyroscopes and compass to track basic data, while combining it with information from other compatible apps to provide an overview. HWM
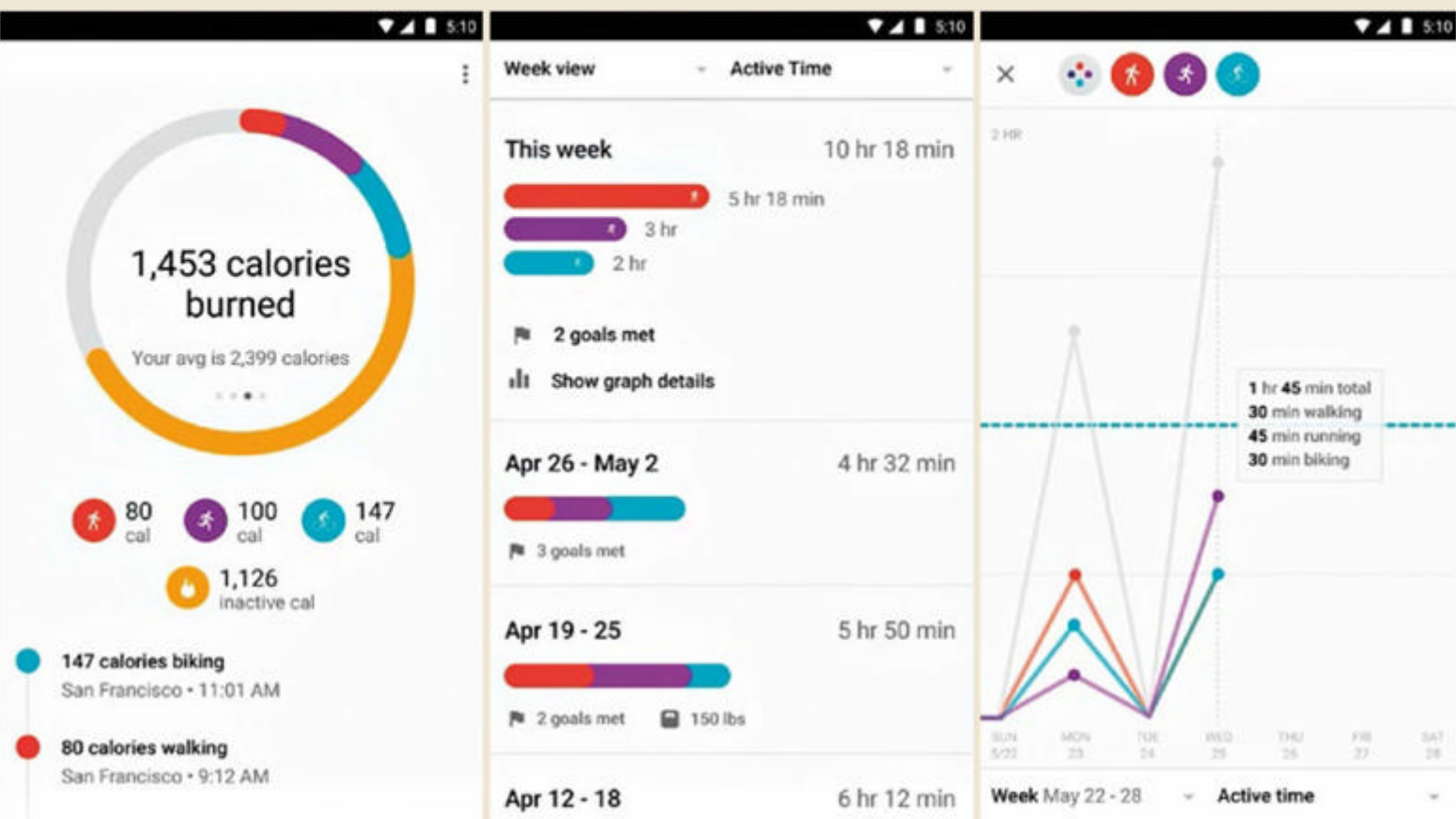
HOLIDAY GO BAG

by *Salehuddin Husin*

You've watched enough TV or movies to know that your mild suburban life can suddenly come to a halt when you find yourself the target of an international espionage manhunt and have to run away one night with your beautiful Russian spy handler...or not. In any case, you should always have a Go Bag prepared for the unexpected. Here's one with all the tech you need for a spontaneous vacation (you can still pretend you're in a spy movie).

GARMIN OREGON 600
WWW.GARMIN.COM

Who needs maps? Unless you're on the trail of pirate booty, maps are irrelevant in today's high tech world. Besides, paper cuts hurt. The Garmin Oregon 600 has a built in 3-axis compass (with accelerometer and barometric sensors), reflective display that works great in sunlight and a state of the art dual battery system, that accepts both conventional AA batteries and the rechargeable internal one. If you have buddies along, you can even wirelessly share data like waypoints, routes or photos. All of which will be invaluable for the rescue team when you inevitably get lost.

SAMSUNG NX-1
WWW.SAMSUNG.COM

If you're going for high-tech cameras, the Samsung NX-1 is one of the better choices out there. It offers decent hardware without emptying your bank account. It has all the trappings of a premium camera, the ability to take up 70 pictures in one shot and an incredibly high 1/8000s shutter speed. You can even shoot great images in low light or record video in 4K resolution. You're probably going to need every single feature of the camera to document your travels. After all, how else will people believe you met Elvis and Michael Jackson at Burning Man?

SENNHEISER MOMENTUM WIRELESS
WWW.SENNHEISER.COM

Traveling often entails spending hours twiddling your thumbs on a plane. The new Momentum Wireless can connect via detachable cable so you never have to use those tinny plastic headphones the airlines provide. It can also be used via Bluetooth; useful when you don't want to be tied down while running away from the bear you accidentally stepped on while trekking. While made from high quality materials, the Momentum Wireless won't protect you from the fury of the bear. But it will make your mangled corpse look stylish at the very least.

LUGLOC
WWW.LUGLOC.COM

The purpose of having a Go Bag is that you can grab it at a moments notice. It'll be unfortunate if you hid it too securely that you can't even find it. That's where the LugLoc comes in. Unlike Bluetooth proximity locators, LugLoc uses GSM-GPRS networks to identify location so you can track it anywhere in the world. You can also throw it in luggage and while it doesn't help one bit to know that your luggage was put on the wrong flight, at least you can rest easy that your winter gear is in Rwanda while you're enjoying the biting cold of Russia.

CASIO EDIFICE EQB-510RBM-1ADR
WWW.CASIO-INTL.COM

Smartwatches are great, but if you already have one too many devices to charge on a holiday, the next best thing is a Bluetooth Smart watch. The Edifice EQB-510RBM is an analog watch yes, but it links with your smartphone to automatically sync time anywhere in the world. It is also clever enough to recharge itself under the sun, is water resistant up to 100 meters and features tough sapphire crystal. As a plus, if you do end up in Australia or Russia, its limited edition Infinity Red Bull Racing livery should get you approving nods from the locals.

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SKINCARE SET WORTH $156

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x JAHAN CLOAK BACKPACK WORTH $249 OR x JAHAN TOTE BAG WORTH $189

SINGAPORE'S NO. 1 MEN'S MAGAZINE TURNS 12!
To celebrate, we're giving away three luxurious getaways to the award-winning five-star Chatrium Hotel Riverside in Bangkok. One lucky reader will get to stay three nights in the well-appointed **Premier Suite worth $7,361!** Also up for grabs are **two 3D/2N stays at the luxury hotel worth up to $3,435.**

LAB RESULTS

Every month behind the doors of our super secret gadget testing facility, the latest tech products are put through their paces using industry recognized benchmarks and our own blend of real world usage scenarios. Here are our findings.

HOW WE RATE:
Products are rated on a scale of **1** to **10**; **1** being so abysmal, it should be a crime to sell it, and **10** being almost perfect. Come now, nothing is perfect. An Editor's Choice may also be awarded based on unique merits.

TEST BEST PERFORMANCE HWM SINGAPORE

TEST BEST VALUE HWM SINGAPORE

TEST EDITOR'S CHOICE HWM SINGAPORE

GETTING YOU IN THE GROOVE

Small and portable, in-ear headphones are perfect for listening on the go, and make a great easy upgrade to your mobile phone's audio. We put a quality selection of in-ear headphones through their paces. Here are our recommendations.

Text by *Marcus Wong*
Photography by *Zaphs Zhang*
Art Direction by *Ken Koh + Ian Chong*

AKG K374

The AKG K374 may be about two years old (it was released here in late 2013), but when we asked for a candidate for this shootout, this was one of the models suggested, perhaps proving that quality sound isn't necessarily about the latest and greatest technologies. Quite the handsome set of headphones, the AKG K374 comes in a bright metallic finish (our pair came in a flashy red) and boasts a compact design that fits nicely into your ears.

Spare silicone ear sleeves of various sizes are included so you can get the best fit for your ears, and we found that these really do improve the passive noise isolation of the headphones, a definite boon if you're listening on the go. Once in, the headphones stay in - even if you're moving your head a lot. Finally, there's a compact travel pouch included which should keep your headphones in better shape on the go.

In terms of sound signature, we feel that this is a pair of bright-sounding headphones that have a crisp response but is conversely a little lean on the low end. There's also a pretty good sense of imaging on these headphones. On a recording of Maiden Voyage by Leny Andrade for example, the piano appears to be dead center of the band, with Andrade's vocals coming just from your right (or piano left). The cymbal work of the drummer in the back gives an added sense of depth to the track, while you'll find Andrade's vocals run perfectly alongside all of it, neither overpowering or being overpowered by the keyboard work that leads the entire piece.

Clearly imaging and the mid-high tones are a strength of this headphones, but where we found they were lacking were in the lower mids to the bass tones. Despite it being rated as being able to go down to 10Hz, we found that on pieces like Tiesto's Elements of Life, the bass could be a little thin, leaving the track without the grounding beat it needs to drive it forward.

➕

Crisp response on the trebles.

➖

Weak lower mid to bass performance.

AT A GLANCE

Frequency response
10Hz-24kHz

Impedance
28Ohm

Sensitivity
120dB

Weight
6g

Price
$139

The AKG K374 comes with a handy carrying pouch for travel.

Spare buds are provided of different sizes so you can get a good fit.

BOSE SOUNDTRUE IN-EAR

Perhaps the most uniquely designed of the group, the Bose SoundTrue In-Ear headphones come in a choice of red, white and black, and stand out easily by the design of the StayHear ear tips that have a sort of wing-tip design to them. While that design makes it seem like the tip will be uncomfortable to fit into your ear, we were pleasantly surprised to note how flexible and comfortable they actually were.

There's again a set of different sizes provided so you can get the best fit, and the SoundTrue In-Ear comes in three options: one without a microphone for audio use only, and two with in-line remotes; with a separate version for iOS and Android devices. Either way the sound is meant to be the same, so you'll get the same performance no matter what device you're using the headphones with.

On our audio testing, we were very pleasantly surprised by the overall balance the SoundTrue In-Ears displayed. There was a nice warm tone on the vocals, and a nice, full sound throughout the entire range. Listening to Sara K's If I Could Sing the Blues, there's a great sense of separation between all the instruments on the track. The saxophone is well-rendered with a good medium body, and the cello parts come in invitingly with good bass resonance, yet nothing overwhelms Sara's vocals, which is just as it should be.

It seems as though the SoundTrue In-Ear excels in the mid-range with a large sweet spot makes for great renditions of vocals and acoustic pieces that feature classic instruments heavily. For example, on our own standard test pieces the SoundTrue In-Ear performed best on The Eagles' Hotel California, with good detail and a nice weight to the bass line. The drum beats had good body, and were round and full. In fact, you can almost hear the tiny squeaks you get from the fretboard when a guitar player shifts his fingering to switch chords.

We'd say the soundstage could probably be a little wider, but overall this is a quality offering from Bose that certainly impressed.

+ Good separation.

− Vocals could be a bit more forward.

The StayHear tips may look a little odd, but really do provide a good fit when in use.

There's a canvas carrying pouch provided for travel.

CREATIVE AURVANA IN-EAR3 PLUS

The Aurvana In-Ear3 Plus is one of this year's new releases, and retains the modern-looking AuraSeal in-ear design from the Aurvana In-Ear3 that's said to provide up to 98% noise isolation while minimizing bass leakage. This design isn't quite the easiest to get used to, but once you get a good fit, it does keep external noise out fairly effectively.

Tangle-free braided fabric is used to reduce contact noise, while the earphones build on the previous model's dual precise Balanced Armature Tweeter and Woofer design for a sound that Creative claims lets you experience music with "clarity and precision like on high-end speakers". Also new, is support for calls thanks to the inclusion of a new in-line remote with integrated microphone that lets you adjust volume by a slider.

We'd actually recommend leaving the slider at full volume and adjusting the playback volume via your media player. During our own testing we inadvertently left the slider down too low at one point and the audio sounded a little flat and overly airy; definitely not the performance we were expecting!

Overall, we'd say these headphones have a fairly good treble to bass performance with an emphasis on a mid-range that's slightly warm and forward. Vocals are sweet, but the bass - while accurate - can tend to sound a little lean relative to the lush midrange. For example, on a recording of Rebecca Pidgeon's Spanish Harlem, her vocals are full and round, and easily appear slightly right of center, but the bass notes subsequently seem a little lost behind her, as did the violins and shakers later on.

This was again reflected on tracks like Hotel California by The Eagles, where the guitar work and Henley's vocals mostly take center stage. For this track, it seemed as though Timothy B. Schmidt's bass guitar gets lost behind the vocals often. Though not as light as the AKG's before it, it did feel as though the Aurvana In-Ear3 Plus could have done with more body in the lower ranges as well.

+

Good reproduction of vocals.

−

Bass can be a little lean on the low end.

The braided fabric cable helps to reduce contact noises.

Leave this volume control at max and for best results.

JAYS A-JAYS 5

Remember the clean lines of the very first iPod? That's what the design of the a-JAYS 5 remind us very much of for some reason. Sleek, minimalistic and elegant. The headphones come with flat cabling so you won't have to deal with mess and tangle, and the provided hard case is simple, yet thoroughly functional.

There's a selection of spare eartips of different sizes provided, as well as a cable clip so you can keep cable chatter down to a minimum. Also included, is a three-button in-line remote with microphone, so you can take calls directly through the headphones. This three-button remote is also the reason why there are three versions of the a-Jay 5; so that there'll be a set that works perfectly with your phone whether it's on iOS, Android or Windows. We found the headphones fit easily into our ears with the medium-sized tips, and their light weight made for comfortable listening.

The a-JAYS 5 seem to display a V-shaped sound signature, with emphasis on the lows and highs over the mids (especially lower mids). Bass depth is pretty good, and you do get sparkling highs, but on certain tracks where Cellos or Basses are featured prominently, you'll feel like some of the lower mids and upper bass notes are quite withdrawn. For example, on Johnny Frigo's I Love Paris, there's a section in the middle that features some violin work that is underscored by bass guitars - the plucking on those bass guitars is barely there with the a-JAYS 5, something that doesn't quite happen on the better headphones in this shoot-out.

That said, trebles are rendered great with a good deal of naturalness to them. Detail and imaging are also strong points. On Hotel California by The Eagles, the a-JAYS 5 picked up the shakers and bongo drums well, using them to set the stage for this lively performance. There was also a nice timbre to the guitar solos, with the a-JAYS 5 nicely picking up every hammer-on and vibrato sustain.

+ Nice, sparkling trebles.

− Lower mid to upper bass range can be suspect at times.

The Jays come with a nice compact hard cover.

There's also a handy in-line remote.

PHILIPS FIDELIO S2

The Philips Fidelio S2 is easily one of the larger headphones in this shootout, with grills on its back much like the Fidelio L2 over-ear headphones we've reviewed before. This again gives the Fidelio S2 a semi-open sound, and with the gold trimmings adds a dash of flash to this pair of in-ear headphones.

There is a selection of eartips that includes a pair of Comply foam tips to offer you the best fit possible, and small cylindrical carrying case is provided that nice and compact. While it's not a full hard case like the one provided with the a-JAYS 5, the case provided does seem like it will easily stand up to knocks and stresses, so your headphones should be safe within them.

Noise isolation probably isn't the strongest suit of the Fidelio S2, so you'll probably get a good half-earful of what your neighbor is doing even when the earbuds are tightly stuffed into your ears. That said, we do think the headphones feel fairly comfortable in our ears, even after extended hours of listening. What did become quickly apparent though, was that the Fidelio S2 needs a good amount of juice to be driven properly. When switching between headphones, we found that we'd have to crank the volume up with the S2.

The Fidelio S2 has a slightly forward and warm sound. It excels on vocal pieces because of this - instruments will be slightly receded - but there is good attack, and a good sense of naturalness. Listening to Grandma's Hands as performed by Livingston Taylor for example, there's a nice sweet tone both in the Livingston's vocals and that of his backing singers as they harmonize together.

With our usual test tracks, we felt that the Fidelio S2 performed best on Melt My Heart to Stone by Adele. The slightly forward nature of the headphones allows Adele's vocals to stand ahead of the backing instruments easily, though at the expense of the lower mid-tones of the main piano accompaniment.

+ Slightly forward nature allows vocals to shine.

− Not very good noise isolation.

AT A GLANCE

Frequency response
15Hz-24kHz

Impedance
22Ohm

Sensitivity
107dB

Weight
N/A

Price
$199

The Fidelio offers a wide selection of replacement tips.

Also features flat cabling.

RHA-MA750I

The RHA-MA750i stands out amongst this group of headphones easily because of the sheer amount of stainless steel used. The drivers are capped in 303F grade stainless steel, as is the three-button remote and even the cable ends off in a plug that's reinforced with a stainless steel spring.

The overall impression thus, is one of quality, and thankfully in this case, the audio does back that up. The loop-back design on the cabling to the earbuds may seem cumbersome at first, but once you get used to them, offer a nice secure fit. Passive isolation is one of its strengths, and it certainly feels comfortable enough in the ears to allow for extended periods of use.

"Round and well-balanced" might perhaps be the best way to describe the sound signature of the RHA-MA750i; it has a nice, robust sound that leans towards the lower notes. There's also plenty of detail to be had. Listening to Leny Andrade's Maiden Voyage, the lead bass is presented with excellent weight and presence, but yet you can still easily pick out the high-hat work by the drummer behind. There's a great sense of atmosphere to this piece, and listening with your eyes closed you can almost visualize the entire setup.

That's further reinforced when you move to something like Hotel California by The Eagles, where the RHA-MA750i's deep bass extension allows it to provide a palpable bass kick to the track, allowing you to really feel Scott Crago's drum work. The headphones border on the edge of having too much bass on this one, but thankfully pick up enough detail in the higher ranges so that none of the guitar work is lost. In fact, it feels like you can hear every pull-off on this piece, which isn't the easiest to do given how much is going on musically at the same time.

Overall, we'd say that these headphones are great at creating a sense of atmosphere, and have pretty good balance through most of its range, except perhaps for the extremes.

+ Very solid construct.

− Might be too bass heavy for some.

AT A GLANCE

Frequency response
16Hz-22kHz

Impedance
16Ohm

Sensitivity
100dB

Weight
36g

Price
$198

The cables are contoured to fit nicely over your ears.

It features a steel reinforced, oxygen-free cable with gold plated connection.

SENNHEISER MOMENTUM IN-EAR

The Sennheiser Momentum In-ears follow the rest of the range in offering a set of in-ear headphones that mix a modern look with a touch of class. The earbuds are a striking red, and feature a high gloss finish that contrasts well against the fabric woven carrying case provided. There's also a three button in-line remote with microphone, and as such, the Momentum In-ears comes in separate versions for Android and iOS.

The earbuds themselves incline horizontally at a 15-degree angle to allow you a better fit, and -as the marketing material puts it - to allow it to adapt to your ears so you'll "forget they are there". We can't say the headphones really adapted to our ears per say, but the small size and slight curve did help provide one of the better fits in this shootout. Overall, it's a comfortable pair of headphones to use.

In terms of audio, the Momentum In-ears excelled in terms of imaging and detail. This is one pair of headphones that does a great job of recreating an environment around you. Putting on a recording of Festival te deum as performed by the Westminster Choir, it almost felt like we were transported to Westminster Abbey. You could hear the organ resonating off the walls of the church as the voices of the choir built to a steady crescendo, and almost feel the emotion in the voices of every singer as they performed.

In our testing it quickly became apparent that Momentum In-ears had a very much balanced sound signature; not heavy on the bass or overly bright on the trebles. Putting on Tiesto's Elements of Life for example, gave an interesting "middling" rendition which had just about enough bass to pace the track, with the detail to pick out every layer of the mix as the track develops. You never lose track of the recurring riff that runs in the background, and there's quite a good sense of dimension to the track. Clearly the Momentum In-ears have a large soundstage and a good attack to match faster moving pieces.

➕
Great detail and imaging.

➖
Balanced signature may not be exciting enough for some.

Spare buds are provided so you can get a good fit.

There's also an in-line remote for easy control.

SONY XBA-A1P

The Sony XBA-A1P has a straight, no-nonsense design that fits easily into your ears, making for good passive noise cancellation, and offering a good degree of comfort. There's also a generous amount of replacement eartips provided in three different sizes, a soft pouch, shirt clip, and a cable adjuster that lets you wind cables of up to 50cm length up neatly, so you pretty much should have all you need straight out of the box.

Audiophiles may be keen to note that the XBA-A1Ps are again being driven by Sony's Hybrid 2-way driver system. This means you'll get both the greater sensitivity and response for the high to mid ranges of a Balanced Armature driver, and the robust low end of a dynamic driver. That's the promise of the system at least, and in this case, we're pleased to say that it really does seem to work.

The XBA-A1P thoroughly impresses in the way it handles all genres of music. From the soulful vocals of Adele recorded live at the Royal Albert Hall, to the bass-heavy lines of Macklemore & Ryan, the XBA-A1P handles it all with aplomb. We were quite taken with the way it presented Sara K's vocals on If I Could Sing the Blues - with good body and a real sense of presence. There's also plenty of detail; making you feel like you've picked up every nuance in her performance, from her quick breaths of air between verses to the high-hat work by her drummer in the background.

Moving over to our own test tracks, we thought the XBA-A1P excelled on Hotel California by The Eagles, as the multitude of instruments and voices at play in this piece served to highlight the headphone's attention to detail. It's a presentation that might best be described as "refined", and we honestly enjoyed being able to pick out every instrument. Elements of Life was another standout, as it really felt as though the music was encompassing us completely. There's plenty of bass presence, and the headphones certainly kept up with the fast pace of this track well.

+

Best performance throughout the audio range.

−

Soft pouch provided might not be adequate protection.

AT A GLANCE

Frequency response
5Hz-25kHz

Impedance
24Ohm

Sensitivity
107dB

Weight
7g

Price
$189

The in-line remote contains a microphone to let you pick up calls.

A large selection of earbuds are provided so you can get the best fit.

MODEL	AKG K374	BOSE SOUNDTRUE IN-EARS	CREATIVE AURVANA IN-EAR3 PLUS	JAYS A-JAY 5
TYPE	In-ear headphones	In-ear headphones	In-ear headphones	In-ear headphones
SENSITIVITY	120dB	N/A	112dB	96dB
IMPEDANCE	28Ohm	N/A	28Ohm	16Ohm
FREQUENCY RESPONSE	10Hz-24kHz	N/A	10Hz-17kHz	18Hz-23kHz
WEIGHT	6g	N/A	15g	N/A
PRICE	$139	$199	$199	$138

MODEL	PHILIPS FIDELIO S2	RHA -MA750I	SENNHEISER MOMENTUM IN-EAR	SONY XBA-A1P
TYPE	In-ear headphones	In-ear headphones	In-ear headphones	In-ear headphones
SENSITIVITY	107dB	100dB	118dB	107dB
IMPEDANCE	22Ohm	16Ohm	18Ohm	24Ohm
FREQUENCY RESPONSE	15Hz-24kHz	16Hz-22kHz	15Hz-22kHz	5Hz-25kHz
WEIGHT	14g	36g	16g	7g
PRICE	$199	$198	$149	$189

AND THE BEST IN-EAR HEADPHONE IS

THE SONY XBA-A1P

RHA might have better bass, and the Bose might have better performance on the vocals, but when you look at overall performance, the Sony XBA-A1P is the one that stands out most from this crop of quality in-ear headphones. It handles all genres of music equally well, yet has the dynamics to be exciting or refined when it needs to be. Just as importantly, it's comfortable enough to keep in your ears for long periods of time, so this is a set of in-ear headphones we quite wholeheartedly recommend.

SENNHEISER MOMENTUM IN-EAR

Owing to its balanced nature, the Sennheiser Momentum In-ear may not have the excitement of some of the other headphones in this shootout. However, that also means it handles every genre of music equally well, and it does it with a sense of refinement that lets it keep up with some of the more expensive offerings here. For $149, that's not bad, not bad at all.

S$318

S$229

S$349

S$3

GETTING THE MOST BANG FOR YOUR BUCK

It's not unusual for the flagship smartphones to cost upwards of $1,000. But if you don't feel like paying a premium for boasting rights, there's good value to be found in mainstream smartphones, many of which actually boast flagship features like Full HD displays and 64-bit octa-core processors. Here are seven smartphones under $350 you should consider.

Text by *James Lu*
Photography by *Veronica Tay + Cheryl Raharjo*
Art Direction by *Ken Koh + Ian Chong*

VS

ASUS ZENFONE 2

•

LENOVO A7000

•

MICROSOFT LUMIA 640

•

OPPO MIRROR 3

•

PHICOMM P660

•

XIAOMI MI 4I

•

ZTE BLADE S6

S$349   S$279   S$349

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ASUS ZENFONE 2 ZE551ML 2GB RAM

ASUS has a few different versions of the ZenFone 2 available. For this shootout, we'll be looking at the ZE551ML 5.5-inch Full HD ZenFone 2 with 2GB RAM. If you're more of a power user, there's also a 4GB RAM version, which also has a slightly faster processor, available for $429.

The ZenFone 2 has an ergonomically curved profile, which fits comfortably into the palm of your hand, letting you keep a firm grip on it. While the phone is entirely plastic, it has a brushed metallic finish on its rear cover that actually looks fairly convincing, at least at arm's length. Removing the back cover reveals two micro-SIM slots and one microSD card slot. The ZenFone 2 supports Cat4 LTE, which provides data transfer rates up till 150Mbps.

Unusually, the volume rocker on the ZenFone 2 is found on the rear of the device, similar to LG's flagship phones. However, on a phone this size, we appreciated the rear button positioning and while it can take a bit of getting used to, we found it ergonomically comfortable and generally easier to reach than side buttons. On the other hand,

for some reason, ASUS has positioned the power button all the way on the top edge of the phone, which is hard to reach when using the phone one-handed. On the plus side, the ZenFone 2 has a built-in feature that lets you double-tap the screen to turn the display on/off, so you may never need to use the physical power button anyway.

This variant of the ZenFone 2 uses a 5.5-inch IPS LCD display with a Full HD 1,920 x 1,080 pixels resolution (403 ppi). Clarity is top notch and color reproduction was accurate, although contrast could probably be a bit better.

On the rear of the phone, you'll find a 13-megapixel, f/2.0, PixelMaster camera module with dual-color LED flash. On the front, there's a 5-megapixel, f/2.0 front-facing camera.

ASUS' proprietary PixelMaster technology combines hardware, software and optical design to deliver superior images in a number of tricky scenarios. It includes digital image stabilization as well as a very useful Low Light Mode, which uses oversampling techniques to increase light sensitivity in poorly lit conditions.

➕ **Comfortable ergonomic build. 5.5-inch Full HD display.**

➖ **Quite thick and heavy.**

AT A GLANCE

OS
Android 5.0 Lollipop with Zen UI

Processor
64-bit Intel Atom Z3560 quad-core 1.8GHz

Display
5.5-inch IPS LCD, 1920 x 1080 resolution (403 ppi)

Dimensions
152.5 x 77.2 x 10.9mm

Weight
170g

Price
$349

The ZenFone 2's volume rocker is positioned on the rear.

The rear of the ZenFone 2 has a brushed metallic finish.

LENOVO A7000

The most affordable phone in our shootout, the Lenovo A7000, costs just $229, making it a full $50 cheaper than the next cheapest, the Xiaomi Mi 4i.

Design-wise, the A7000 is about as safe as they come. The phone has a utilitarian rectangular design with slightly rounded rear edges for a more comfortable grip.

The entire phone is made of plastic, but feels relatively sturdy. One complaint we have is that the matte finish looks a bit cheap and tends to pick up grease and oily fingerprints quite easily. The right edge of the phone houses the volume rocker and the power button, which thankfully are made of metal and have a etched circular pattern on them for a bit of tactile feedback. The top edge houses both the headphone jack and MicroUSB port, leaving the left and bottom edges port-free.

The rear cover is removable and hides two micro-SIM card slots and a microSD card slot. Unfortunately the phone only has 8GB internal storage, and the microSD slot only supports cards up to a measly 32GB.

The A7000 has a 5.5-inch IPS LCD display with a HD 1,280 x 720 pixels resolution (267 ppi), giving it the lowest pixel density of any of our phones. Clarity on the phone isn't too bad, but it is noticeably worse than the Full HD display on our other 5.5-inch device, the ASUS ZenFone 2. Color reproduction is decent if a little warm, and viewing angles and brightness are quite good overall.

One of the unique features on the A7000 is that it is one of the first phones to support Dolby's Atmos technology. This technology replicates a surround sound experience with any pair of headphones. Do note that you need to be watching Dolby Atmos certified movies or trailers for the technology to work.

On the rear of the phone you'll find an 8-megapixel camera with a 1/4-inch Sony Exmor IMX219 sensor and a dual LED flash. On the front, there's also a 5-megapixel front-facing camera. Lenovo's default camera interface is fairly clean and easy to use but a little on the basic side.

➕ **Dobly Atmos support.**

➖ **Boring design. Only supports MicroSD cards up to 32GB.**

The most interesting design flair on the phone is its metal power and volume buttons.

The A7000 has a single speaker located on its rear.

MICROSOFT LUMIA 640

The Lumia 640 is the only non-Android phone in our shootout, instead it's running on Windows Phone 8.1 OS, made up of big, colorful tiles that will come as a refreshing change to anyone that's tired of Android (or even iOS).

The Lumia 640 has a one-piece polycarbonate design that bends around to meet the screen at the front. It is slightly on the thick side, measuring 8.8mm, and also a bit more angular than some of the Lumia phones we've seen in the past, but it's still very comfortable to hold.

The stiff polycarbonate feels sturdy and well-built, and you can actually swap out the rear cover if you feel like changing colors.

The headphone jack can be found at the top of the phone, while the micro-USB port is at the bottom. The power button and volume rocker can be found on the right side, while the Micro-SIM and microSD card slots can be found hidden beneath the rear panel. You'll definitely want to make use of that microSD card slot, which supports cards up to 128GB, as the phone only comes with a mere 8GB of on-board storage.

The Lumia 640 has a 5-inch IPS LCD display with a 1,280 x 720 pixels resolution (294 ppi), which isn't as good as the Full HD models in our shootout, but is still reasonably adequate. Color reproduction is fairly good with vivid colors and there's a decent level of contrast too.

Turn the phone over and you'll find an 8-megapixel rear camera which, despite its fairly low megapixel count is actually quite decent with sharp focus and good color reproduction. The same can't be said of the phone's front-facing camera, which is just 0.9-megapixels and barely usable, resulting in low-quality, grainy selfies.

If you're unfamiliar with Windows Phone OS, the homescreen is made up of a scrolling list of colorful tiles that show live information, and can be resized and rearranged to your liking. The 8.1 Denim update brings some much-needed updates like a pull-down panel showing incoming notifications and settings like the screen brightness and Wi-Fi.

➕
Swappable rear covers.

➖
Low resolution front camera. 32-bit processor.

AT A GLANCE

OS
Windows Phone 8.1 Denim

Processor
32-bit Qualcomm Snapdragon 400 Quad-core 1.2GHz

Display
5-inch IPS LCD, 1,280 x 720 resolution (294 ppi)

Dimensions
141.3 x 72.2 x 8.8mm

Weight
145g

Price
$300

You can easily replace the rear cover of the Lumia 640 if you feel like changing the color of your phone.

The Lumia 640 has a single, small speaker located on its rear.

OPPO MIRROR 3

The Oppo Mirror 3 is a reasonably compact 4.7-inch phone with a slightly rounded rear profile. However, unlike the ASUS ZenFone 2, which also has a curvy rear, the phone isn't as comfortable to hold due to a prominent ridge along its frame that tends to bite into your palm. Additionally, while the Mirror 3 has the smallest display size in our shootout, it's actually rather thick at 8.9mm.

The phone is made entirely of plastic but feels relatively sturdy. The back of the phone has an interesting micro-dot pattern that looks to be textured, but as it's covered in a thick layer of gloss, it feels smooth to touch. Remove the back cover and you'll find two micro-SIM card slots and a microSD card slot, which supports cards up to 128GB. The phone only has 8GB internal storage, so you'll definitely need a microSD card.

The Mirror 3 has a 4.7-inch IPS LCD display with a 1,280 x 720 pixels resolution (312 ppi). Clarity is reasonably good, although it doesn't match up to the Full HD models in our shootout. The display is quite bright with good viewing angles and decent color reproduction.

On the back of the phone, you'll find an 8-megapixel camera with a backside-illuminated 1/3.2-inch Sony Exmor IMX179 sensor with an f/2.0 aperture, 5-element lens and a blue light filter, which is designed to reduce the effects of ultraviolet light. On the front of the phone, you'll find a 5-megapixel camera for selfies. Oppo's camera app includes a multitude of shooting modes including HDR, panorama, expert mode, double exposure and even a GIF creation mode. The camera also performs especially well in low light situations thank to its Sony IMX179 sensor.

One feature of the Mirror 3 that's worth mentioning is its Fast Charge capabilities, something that we often see on flagship smartphones but rarely at this price range. While the Mirror 3 has a relatively small 2,000mAh battery, it only takes about 90 minutes to fully charge the device, which is much faster than anything else here.

➕ Fast Charge. Good low-light camera performance.

➖ Android 4.4.4. Only 1GB RAM.

The Mirror 3 has an IR blaster on top for controlling your TV.

The rear of the Mirror 3 has an interesting micro dot pattern.

PHICOMM P660

Phicomm is a Chinese manufacturer that is new to the Singapore market. Its first phone here is the P660, a minimalist slab style smartphone that looks quite similar to Sony's Xperia Z flagship phones. The phone has a unibody design with distinct, sharp corners and is made from plastic with brushed magnesium alloy side panels making it the only phone in our shootout to utilize metal in its build, a very nice premium touch for a phone in this price range.

The 5-inch phone is the thinnest in our shootout, measuring just 7.3mm, and it's also remarkably light, weighing a mere 110g. A metal power button with an unusual oblong shape and an attractive bronze trim on its edge can be found on the right side of the phone, and you'll also find a Micro SIM slot, as well as a Nano SIM slot that doubles up as a MicroSD card slot, here. The volume rocker is located on the left-edge, while the headphone jack can be found on top, and the microUSB port, on the bottom.

+

Magnesium alloy side panels. Thin. Light.

–

Android 4.4.4.

The rear of the phone has a soft-touch matte finish which is pretty good at resisting fingerprints and scratches. Due to its angular edges and lack of curves, the P660 isn't the most comfortable phone to hold, but it does provide you with a secure grip.

The P660 has a 5-inch Full HD IPS LCD display with a 1,920 x 1,080 pixels resolution (441ppi). On paper this gives it the same specs as Xiaomi's Mi 4i, however, in our opinion, Xiaomi has the better display. Overall clarity between the two displays is about the same, but the Mi 4i's display is noticeably brighter and also boasts more accurate color reproduction. We found the P660 display to be slightly on the warm side, although its contrast was quite good and viewing angles were decent too.

The rear of the P660 sports a 13-megapixel camera with a 1/3.06-inch Sony Exmor RS IMX214 CMOS sensor, f/2.0 aperture lens and LED flash. On the front, you'll find a 5-megapixel camera with an 84-degree wide angle view, which is great for group selfies.

The P660 has brushed magnesium alloy side panels.

The P660 has dual SIM card slots.

XIAOMI MI 4I

The Xiaomi Mi 4i was launched earlier this year in India (the 'i' stands for India) as a cheaper alternative to Xiaomi's Mi 4. Compared to the Mi 4, the Mi 4i uses Qualcomm's Snapdragon 615 processor instead of the Snapdragon 801 and it only has 2GB RAM instead of 3GB.

The Mi 4i has a minimalist rectangular body with rounded edges and a smooth soft-touch matte finish. Constructed from a single piece of polycarbonate, the Mi 4i feels light and well-made, and somewhat similar to Microsoft's Lumia range. At 7.8mm thin, the phone is fairly slim, and its rounded edges let the Mi 4i sit comfortably in hand.

A SIM card tray with two Micro SIM slots can be found on the left of the phone. The headphone jack is found at the top of the phone, while the micro-USB port sits at the bottom of the device. Both the volume rocker and power button can be found on the right side.

The Mi 4i sports a 5-inch IPS LCD display with a Full HD 1,920 x 1,080 pixels resolution (441ppi). Clarity is top notch and both text and pictures look crisp and clean. Color reproduction is also excellent, with the Mi 4i's display capable of reproducing up to 95 percent of colors found in the NTSC palette, which puts it on par with a flagship device.

The Mi 4i's display is also equipped with useful new technology called Sunlight Display, which uses hardware-level algorithms to increase visibility under bright sunlight by automatically boosting contrast and midtones.

Flip the phone around and you'll find a 13-megapixel camera with a 1/3.06-inch Sony Exmor RS IMX214 CMOS sensor, five-element lens construction, f/2.0 aperture, and a Philips dual-LED warm/cold flash. The front of the phone has a 5-megapixel camera.

Like the Oppo Mirror 3, the Mi 4i supports Quick Charging, and can go from flat to full in about three hours.

Something worth noting about the Mi 4i that could end up being a deal breaker for many is that it's the only phone in our shootout without expandable storage, so you'll have to make do with its small 16GB internal storage.

⊕ Sunlight Display increases visibility under bright light. 95 percent NTSC color reproduction.

⊖ No expandable storage.

AT A GLANCE

OS
Android 5.0 Lollipop with MIUI 6

Processor
64-bit Qualcomm Snapdragon 615 octa-core (Quad-core 1.7GHz & Quad-core 1.1GHz)

Display
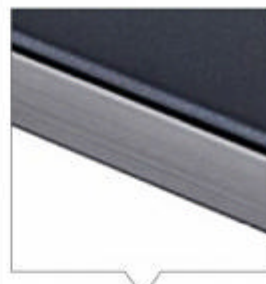5-inch IPS LCD, 1,920 x 1,080 resolution (441 ppi)

Dimensions
138.1 x 69.6 x 7.8mm

Weight
130g

Price
$279

The Mi 4i's rear camera has a Philips dual-LED flash.

The Mi 4i has a speaker grille located on the rear of the phone.

ZTE BLADE S6

The ZTE Blade S6 looks just like Apple's iPhone 6. It shares a very similar shape, with the same rounded edge design, and similar looking buttons, and it even has a faux aluminum rear, which is actually plastic, but does look fairly convincing from a few feet away. There's even a 'designed by ZTE in California, assembled in China' print on the rear, in the same place as Apple's famous wording. The only thing missing are the antenna bands (plastic phones don't need them). No points for originality, but since the Blade S6 basically looks like an iPhone, naturally it's quite attractive, especially for a phone in this price range. In hand, the plastic feels a bit cheap, and the phone is much lighter than an iPhone 6, but it's comfortable to hold overall.

Button placement on the S6 isn't exactly the same as Apple's, with both the power button and volume rocker located on the right-side. On the left, you'll find a microSD card slot and a SIM card tray that holds dual 4G Nano SIMs. The audio jack can be found at the top of the phone, while the microUSB port is found at the bottom.

The Blade S6 sports a 5-inch 1,280 x 720 HD display (293 ppi). Clarity isn't as good as the Full HD models in our shootout, but viewing angles are fairly decent and the display does boast fairly bright and vivid colors. At the bottom of the screen, the S6 has a small circle indicating the home button. It looks a bit like Apple's Touch ID button, but it's not, it's just a regular capacitive home button.

On the back of the S6 you'll find a 13-megapixel 1/3.06-inch Sony Exmor RS IMX214 sensor, which is the same camera sensor used by Xiaomi and Phicomm. ZTE has also added a few software optimizations to get the most out of the camera, including an 'Expert' mode that lets you manually adjust metering, ISO levels and focal points. The front camera on the Blade S6 is a 5MP shooter with a wide-angle 80 degree lens, making it ideal for group selfies.

➕ **Looks just like an iPhone.**

➖ **Looks just like an iphone.**

"Designed in California by ZTE."

The Blade S6 has Dual SIM card slots.

Sunspider Javascript
(lower is better)

SunSpider JavaScript measures the browsing performance of a device when processing JavaScript. It not only takes into consideration the underlying hardware performance, but also assesses how optimized a particular platform is at delivering a high-speed web browsing experience. The ASUS ZenFone 2 was the clear winner in this benchmark, with a blistering speed of 688.8ms, which surpasses even flagship smartphones.

ASUS ZENFONE 2 — **688.6**
LENOVO A7000 — 1,514.3
MICROSOFT LUMIA 640 — 1,203.1
OPPO MIRROR 3 — 1,163.5
PHICOMM P660 — 1,124.3
XIAOMI MI 4I — 1,358.6
ZTE BLADE S6 — 1,084.3
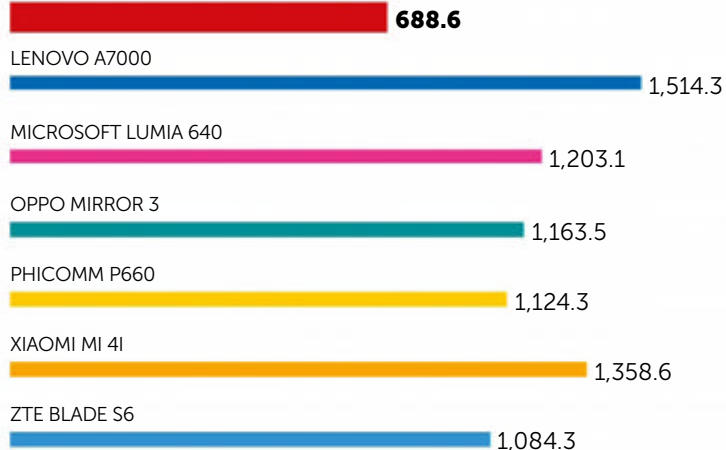
3DMark 2013 – Ice Storm Unlimited
(higher is better)

3DMark 2013 - Ice Storm is designed to test the gaming capabilities of a device, putting its GPU through a rigorous OpenGL ES 2.0 benchmark test that uses fixed off-screen rendering with high quality textures and post-processing effects. The Unlimited version of the benchmark disables v-sync, display scaling and other OS factors, making it ideal for chipset comparison.

The ZenFone 2's PowerVR G6430 GPU was surprisingly dominant, easily outscoring the rest of the field. There wasn't much to separate the rest of our smartphones, although it looks like the Lumia 640 and Mirror 3 were held back by having just 1GB RAM.

ASUS ZENFONE 2 — **19,473**
LENOVO A7000 — 9,160
MICROSOFT LUMIA 640 — 6,845
OPPO MIRROR 3 — 7,423
PHICOMM P660 — 8,042
XIAOMI MI 4I — 8,406
ZTE BLADE S6 — 8,189
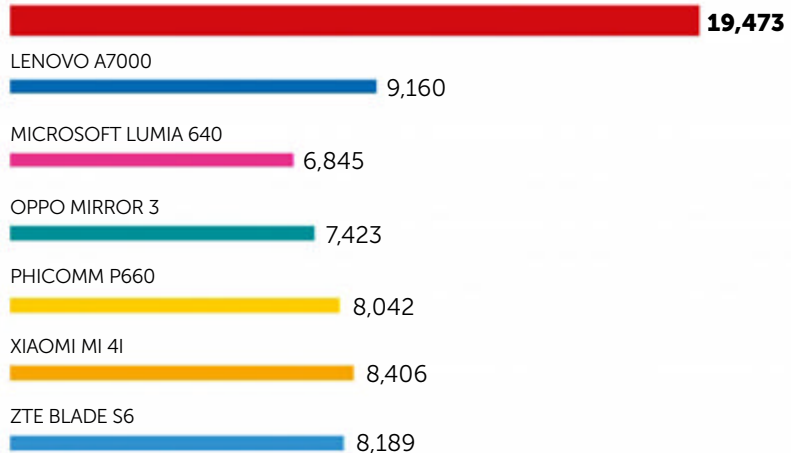
Battery Life
(in minutes)

Our standard battery test for mobile phones involves looping a 800 x 480-pixel video with screen brightness and volume at 100%, Wi-Fi and Bluetooth connectivity turned on, and constant data streaming through email and Twitter.

As expected, the phones with lower resolutions did better in our battery life benchmark, and the Lumia 640's combination of a reasonably small screen, HD resolution display, and a relatively underpowered processor made it the clear winner here.

ASUS ZENFONE 6 — 434
LENOVO A7000 — 452
MICROSOFT LUMIA 640 — **538**
OPPO MIRROR 3 — 415
PHICOMM P660 — 369
XIAOMI MI 4I — 411
ZTE BLADE S6 — 470
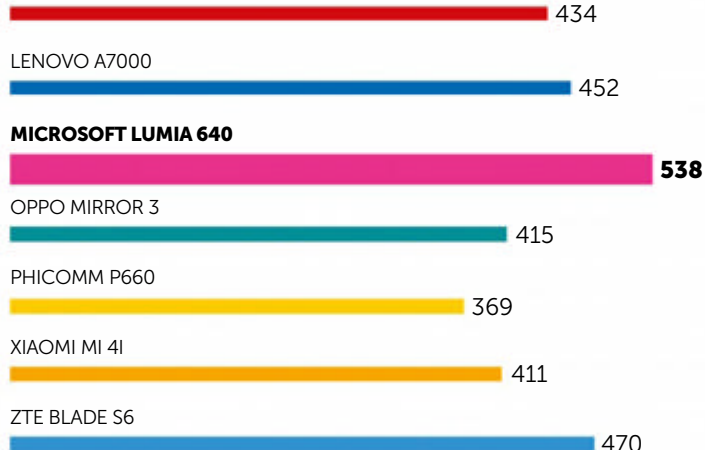
	ASUS ZENFONE 2	LENOVO A7000	MICROSOFT LUMIA 640 LTE
MODEL	ASUS ZENFONE 2	LENOVO A7000	MICROSOFT LUMIA 640 LTE
OS	Android 5.0 Lollipop with Zen UI	Android 5.0 Lollipop with Vibe UI 3.0	Windows Phone 8.1 Denim
DISPLAY	5.5-inch IPS LCD	5.5-inch IPS LCD	5-inch IPS LCD
RESOLUTION	1,920 x 1,080 (403 ppi)	1,280 x 720 (267 ppi)	1,280 x 720 (294 ppi)
PROCESSOR	64-bit Intel Atom Z3560 Quad-core 1.8GHz	64-bit MediaTek MT6752m Octa-core 1.5GHz	32-bit Qualcomm Snapdragon 400 Quad-core 1.2GHz
RAM	2GB	2GB	1GB
REAR CAMERA	13MP	8MP	8MP
FRONT CAMERA	5MP	5MP	0.9MP
INTERNAL STORAGE	32GB	8GB	8GB
EXPANDABLE STORAGE	64GB	32GB	128GB
CONNECTIVITY	4G LTE, Wi-Fi 802.11 a/b/g/n/ac, Wi-Fi Direct, Bluetooth v4.0, A2DP, EDR	4G LTE, Wi-Fi 802.11 b/g/n, Bluetooth v4.0, A2DP	4G LTE, Wi-Fi 802.11 b/g/n, DLNA, Bluetooth v4.0, A2DP
BATTERY	3,000mAh	2,900mAh	2,500mAh
DIMENSIONS	152.5 x 77.2 x 10.9mm	152.6 x 76.2 x 8mm	141.3 x 72.2 x 8.8mm
WEIGHT	170g	140g	145g
PRICE	$349	$229	$300

OPPO MIRROR 3	PHICOMM P660	XIAOMI MI 4I	ZTE BLADE S6
Android 4.4.4 KitKat with Color OS 2.0	Android 4.4.4 KitKat with Expect UI 5	Android 5.0 Lollipop with MIUI 6	Android 5.0 Lollipop with MiFavor 3.0
4.7-inch IPS LCD	5-inch IPS LCD	5-inch IPS LCD	5-inch IPS LCD
1,280 x 720 (312 ppi)	1,920 x 1,080 (441 ppi)	1,920 x 1,080 (441 ppi)	1,280 x 720 (294 ppi)
64-bit Qualcomm Snapdragon 410 Quad-core 1.2GHz	64-bit Qualcomm Snapdragon 615 octa-core (Quad-core 1.5GHz & Quad-core 1.0GHz)	64-bit Qualcomm Snapdragon 615 octa-core (Quad-core 1.7GHz & Quad-core 1.1GHz)	64-bit Qualcomm Snapdragon 615 octa-core (Quad-core 1.5GHz & Quad-core 1.0GHz)
1GB	2GB	2GB	2GB
8MP	13MP	13MP	13MP
5MP	5MP	5MP	5MP
8GB	32GB	16GB	16GB
128GB	64GB	None	64GB
4G LTE, Wi-Fi 802.11 b/g/n, Bluetooth v4.0	4G LTE, Wi-Fi 802.11 b/g/n, Wi-Fi Direct, Bluetooth v4.0	4G LTE, Wi-Fi 802.11 a/b/g/n/ac, 4G LTE, dual-band, Wi-Fi Direct, Bluetooth v4.1, A2DP	4G LTE, Wi-Fi 802.11 a/b/g/n/ac, Wi-Fi Direct, Bluetooth v4.0, A2DP
2,000mAh	2,300mAh	3,120mAh	2,400mAh
137.7 x 68.8 x 8.9mm	139.5 x 69 mm x 7.3mm	138.1 x 69.6 x 7.8mm	144 x 70.7 x 7.7mm
130g	110g	130g	154g
$349	$318	$279	$349

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ASUS ZENFONE 2 ZE551ML 2GB RAM

Our best performance award goes to the ASUS Zenfone 2, not only for its overall excellent benchmark scores, but also its top notch Full HD display, and great rear and front camera. We also liked its ergonomic curved rear design, rear volume buttons and quick launch features. If you're in the market for something a little more powerful, you can opt for the $429 4GB Zenfone 2, which also has a slightly faster processor.

XIAOMI MI 4I

Our best value award came down to two competitors, the Xiaomi Mi 4i and the Phicomm P660. Both phones boast Full HD 5-inch displays and very similar camera modules. The P660 boasts a more premium build with a sleeker, thinner and lighter design that includes magnesium alloy side panels, while the Mi 4i has a better overall display, a larger battery, a faster processor and is $50 cheaper. In the end, we felt that Xiaomi's pros outweigh Phicomm's. Having said that, the Mi 4i comes with a very big caveat of only having 16GB internal storage and no expandable storage. If you need more storage, go for the Phicomm P660.

TWO DEVICES, ONE DRIVE

SanDisk iXpand

AT A GLANCE

Manufacturer
SanDisk

Storage
16GB, 32GB, 64GB, 128GB

Connectors
USB 2.0, Lightning

Price
From $88

The flexible Lightning connector sits in a recessed slot on the flat side of the drive.

CONCLUSION

Cloud syncing is great and all, but being able to share files between iOS and PCs in a flash is what the iXpand is all about.

The SanDisk iXpand flash drive is a really interesting piece of tech. Its main purpose is to serve as a bridge of sorts, so that you can transfer media easily between iOS devices and PCs without needing iTunes or cloud syncing. It's not a particularly new concept as flash drives for Android OTG devices have been making their rounds for the past year. SanDisk themselves have one called the SanDisk Ultra Dual.

Working on the same principle, the iXpand is essentially a portable flash drive with both USB and Lightning connectors. It works as you'd expect when plugged into a USB port of any PC, but requires the bundled SanDisk app—which acts as the file explorer and player —on iOS devices.

The iXpand drive is extremely light, though for some reason SanDisk designed it to be square and boxy, which will definitely cause problems with adjoining ports if you try to plug it into a notebook. Not only that, the drive features a USB connector at the top and a flexible rubber-like Lightning cable on the flat side of the device. The USB connector has a clear plastic covering, but the Lightning cable is exposed and prone to dust build up in its recessed slot. It's not too much of an issue really, but we'd have much preferred straightforward design of the aforementioned SanDisk Ultra Dual, which just looks like a regular flash stick with the two different connectors on opposite ends.

Unlike the Ultra Dual, which is a USB 3.0 device, the iXpand is only USB 2.0 on the PC side of things. While data transfer will definitely be slower, it should still be sufficient for its intended use to quickly offload media from your iPhone/iPad. You can set the app to automatically backup photos from your phone when the drive is connected too. It's also great for travel since it reduces the steps required to copy or sync your entertainment selection for that long-haul flight. Now, all you need to do is plug into a PC, drag files over and you're basically done.

The iXpand comes in a variety of storage options, from 16GB all the way up to 128GB. However, do take note that for the drive to work with both PC and iOS, it has to be formatted in FAT32, which limits the maximum readable file size to 4GB.

by *Salehuddin Husin*

TESTED & RATED

8.0/10

HWM
SINGAPORE

INCHING CLOSER TO PERFECTION

LG G4

AT A GLANCE

OS
Android 5.1 Lollipop with LG UX 4.0

Display
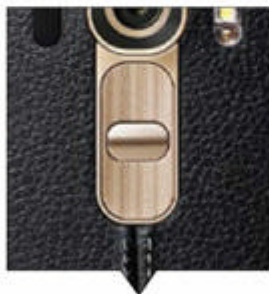5.5-inch IPS LCD, 2,560 x 1,440 pixels resolution (538 ppi)

Dimensions
148.9 x 76.1 x 6.3~9.8mm

Weight
155g

Price
$928 (standard)
$998 (leather rear)

Like the G2 and G3, the G4 has all of its buttons positioned on the rear of the phone.

Dubbed the Slim Arc design, the LG G4 has a slight curve that runs along the entire chassis. Though it is not as pronounced as its G Flex 2 counterpart, you can feel the phone fitting the contours of your hands in a natural manner unlike the flat designs of the Apple iPhone 6 and Sony Xperia Z smartphones.

Besides offering a more comfortable grip of the phone in one hand, LG claims that the Slim Arc design offers 20% more durability in comparison to a flat smartphones in the event of accidental face-down drops. Another design aspect to improve the handling of the G4 is the use of vegetable-tanned, full grained leather back. Just to be clear, you have two options when purchasing the G4; the $998 option will get you a leather back cover (black, brown or red) while the $928 option gives you a more standard rear finish (plastic) of metallic gray or shiny gold. The leather material, which is also used to make high-quality, luxury bags and wallets, provides a better grip of the G4 than the standard finish.

As the back cover is removable, LG has included a memory card slot and a removable battery in the G4. The phone is available in one storage option (32GB) and you have about 20.42GB of available storage space out of the box after updating the preloaded apps. If you are a power user who requires massive amount of storage space for your music files, photos and videos, the G4 fits the bill as it is able to support microSD cards of up to 128GB.

Like the LG G2 and G3, the G4 has a rear-button setup, with the power and volume buttons are all located on the rear of the phone under the camera module. This ergonomic setup takes a little bit of getting used to, but makes sense on a device this size.

The G4 has a 5.5-inch QHD, 2,560 x 1,440 pixel resolution IPS LCD display. Even though there is no increase in display resolution and size from the G3, LG has made significant improvements to the display technology on the G4. The G4 is the first smartphone to deliver 98% of the digital cinema initiative (DCI) color standard, which in layman terms, means that color rendering is more accurate and best represents what cinematographers expect to deliver to its audience.

Forget faux stitching, the G4 is available in a genuine vegetable tanned leather rear with real stitching.

CONCLUSION

A top-notch smartphone with a fantastic camera, display and luxurious leather design. Just watch your battery usage.

The G4 has a new camera module, and is one of the few smartphones in the world to come with an aperture of f/1.8 for the rear camera. The G4 is also the first smartphone to be equipped with a color spectrum sensor. The color spectrum sensor helps to improve color accuracy by measuring the ambient light and then adjusting the white balance and flash color according to the scene. Finally, the G4 also one-ups the competition with its new optical image stabilization (OIS) 2.0 system, which offers a 3-axis gyroscope instead of the standard 2-axis implementation in most other smartphones with OIS.

The G4 is the first smartphone to be powered by the Qualcomm Snapdragon 808 hexa-core processor with X10 LTE. It consists of two 1.8GHz Cortex A57 cores with four 1.44GHz Cortex A53 cores and Adreno 418 GPU. Surprisingly, LG chose not to use Qualcomm's flagship SoC, the octa-core Snapdragon 810. LG defended its choice by saying that they could optimize the Snapdragon 808 on the G4 to deliver the best mobile experience for consumers just as well as a Snapdragon 810 can.

In our benchmark though, we found that to be not entirely accurate as 810-equipped devices were able to surpass the LG G4 by around 15-20 percent. Battery life on the G4 was also lower than expected, lasting just over six hours in our video looping battery benchmark.

Still, all things considered, the G4 is certainly in the running for the best Android flagship smartphone this year. It might not be as perfect as we hoped it to be and not a stellar benchmark performer if that's the kind of thing you go for, but it was able to deliver the fast and smooth flagship phone experience LG promised. You can easily expect the G4

to juggle multiple apps and blaze through games with ease. The only real issue that holds it back is battery performace.

LG has also focussed much of its design efforts on the rear of the device, which unfortunately leaves the rest with little improvement over its predecessor. This is especially true on the front face, which naturally sees more user interaction. Existing G3 owners will attest to this and might even go so far as to say that the G4 is more of an iteration since they see it as a more polished and advanced G3.

by *Cookie Monster*

TESTED & RATED

8.5/10

HWM
S I N G A P O R E

IN SEARCH OF ULTIMATE PORTABILITY

Apple MacBook

AT A GLANCE

Processor
Intel Core M-5Y31 processor (1.1GHz, 4MB L3 cache)

Memory
8GB

Graphics
Intel HD Graphics 5300

Storage
256GB

Price
$1,788

The MacBook's logic board is Apple's tiniest yet and is 67% smaller than that of the 11-inch MacBook Air's.

Earlier this year, Apple resurrected the MacBook by introducing a new ultra-slim, ultra-light notebook. It couldn't have come at a better time as the MacBook Air is starting to become chubby by today's standards, so much so that the Air in its name is becoming a bit of a misnomer. To set things right, here is the new MacBook.

The important details first: the MacBook is just 13.2mm at its thickest point and weighs just 920g - making it one of the few notebooks in the market to tip the scales at under a kilogram. Since the MacBook was designed for utmost portability, Apple has had to re-engineer many important components to make the MacBook work.

Firstly, Intel's new low-power Core M processors power the MacBook. With a rated TDP of just 4.5W, these processors require no active cooling; hence the MacBook's chassis has no fans. Our review unit is the entry-level model, powered by an Intel Core M-5Y31 processor that seems to have been factory overclocked to run at 1.1GHz - Intel's specifications states that this processor should instead run at just 800MHz.

To keep the MacBook compact, it has a 12-inch Retina display with an atypical resolution of 2,304 x 1,440 pixels (16:10 aspect ratio). This gives it a pixel density count of a very respectable 226 pixels per inch - comparable to both the 13 and 15-inch MacBook Pros with Retina display. The Retina display is Apple's thinnest ever and measures just 0.88m thick. This was achieved by using a special manufacturing process that forms the glass closer to the display itself. The individual pixels have larger apertures that allow more light to pass through. This means less power required to light them, which in turns improves battery life.

To shave further millimeters off the thickness, Apple has also re-engineered the keyboard with specially designed butterfly switches. This new switch reduces the wobbling associated with the traditional scissor mechanism and provides stable, reliable feedback for a tactile typing experience. More importantly, the new butterfly mechanism is a whopping 40% thinner than the previous scissor switch design.

Keyboard aside, the MacBook also gets Apple's new Force Touch trackpad. Apple's traditional trackpad was deemed too thick and so the Force Touch trackpad eschews buttons and instead uses sensors and electromagnets to generate a haptic feedback when it is being interacted. But, it does not feel like any haptic feedback we have experienced before, it

Because the MacBook is only 13.2mm thick at its thickest point, Apple had to make down with a slimmer USB Type-C port.

CONCLUSION

Supremely portable, the MacBook is a godsend to mobile warriors.

actually feels like a proper click.

Due to its slimness though, Apple has had to forgo standard ports and instead use a single USB Type-C port for everything - power, data and video. The only other port the MacBook has is a 3.5mm audio jack. The USB Type-C port is superior to the standard USB Type-A port in all respects. It's smaller, reversible, and if it supports the newer USB 3.1 standard like the MacBook does, it can also provide more data bandwidth and power. The only problem is that there are only a handful of devices that are compatible with this new connector. USB Type-A is still the de facto connector for many USB devices today and it will certainly take some time - years maybe - before the entire industry shifts towards this new smaller,

more compact connector. This, coupled with the fact that the MacBook only has a single port, means that adapters and hubs are a must if you wish to connect devices to the MacBook. The alternative is to go completely wireless.

Despite the low power Core M processor, the MacBook runs most apps very briskly and will suffice for most users. It can run productivity apps smoothly, watch high-resolution videos flawlessly and can browse most websites without a hitch, even if one had a dozen or so tabs opened. Furthermore, the Core M processor had a huge role to play in the MacBook's fantastically long battery life. It lasted just 13 minutes shy of five hours in our battery test, which runs through a wide variety of different tasks, including video editing and gaming.

All in all, the MacBook is one of the most portable ultraportable notebooks in the market today and comes highly recommended if portability is your utmost priority. The lone USB Type-C port will take some getting used to, but if that doesn't faze you, then there are few notebooks in the market that compete against the MacBook's combination of stunning good looks, decent performance and extreme portability.

by *Kenny Yeo*

TESTED & RATED

8.5/10

HWM
SINGAPORE

SURFACE FOR A DIFFERENT AUDIENCE

Microsoft Surface 3

AT A GLANCE

Processor
Intel Atom x7-Z8700
(1.6GHz, 2MB L3 cache)

Memory
4GB LPDDR3 RAM

Graphics
Intel HD Graphics

Storage
128GB eMMC flash

Price
$898

The Surface 3 has one USB 3.0 port and one mini DisplayPort output on its right edge.

While the Microsoft Surface line of 2-in-1 devices has had a checkered history, Microsoft finally hit on a winning formula with last year's Surface Pro 3. The tablet was exceedingly well received, and the Surface 3 aims to deliver more of the same in a more affordable package.

At just 622g and 8.7mm thick, the Surface 3 is the lightest and thinnest Surface yet. Like its larger predecessor, the Surface 3 boasts of an equally impeccable build quality and silver-gray magnesium alloy construction. However, Microsoft has made several notable changes under the hood to deliver essential functionality at a lower cost.

The Surface 3 is powered by Intel's new 64-bit, quad-core Atom x7-Z8700 processor (1.6GHz base clock, 2.4GHz burst clock). Despite the typically low performance of Atom processors, the Surface 3 feels zippy and more than up for everyday productivity tasks. Thankfully, the Intel Atom x7-Z8700 still supports x86 Windows, so the Surface 3 still runs on Windows 8.1, making it eligible for a free upgrade to Windows 10.

In the storage department, Microsoft has also implemented a lower cost solution in the form of 128GB of eMMC flash memory typically found on smartphones rather than notebooks.

In addition, the front camera now features a 3.5MP fixed focus shooter, down from 5MP on the Surface Pro 3. However, the rear camera has been upgraded to an 8MP one with auto-focus, a notable improvement over the 5MP fixed-focus camera on the larger Surface. This decision effectively

reflects Microsoft's design philosophy with the Surface 3 – it is focusing its resources on the areas that count and cutting back in other less important aspects.

The 10.8-inch display preserves the same 3:2 aspect ratio as the Surface Pro 3 with a 1,920 x 1,280 resolution. This means it's suited for productivity tasks that benefit from having a so-called taller display to enable you to see more of a document. And with a pixel density of 214ppi, the Surface 3 is almost on par with the Surface Pro 3's 216ppi despite the latter's quad HD display.

Microsoft has also implemented a more cost-effective version of the multi-position, friction hinge kickstand on the Surface Pro 3. While the new kickstand may seem like a huge compromise with just three fixed positions,

The Surface 3's kickstand is solidly constructed, with three fixed positions.

CONCLUSION

The Surface 3 is the Surface Pro 3 distilled down to its core elements, resulting in an excellent device for a more casual crowd.

that isn't necessarily the case. It notches into each of the three positions with reassuring feedback and provides solid support. The versatility of the Surface Pro 3's kickstand was a much-valued feature, but the Surface 3's kickstand works so well that the much-lauded multi-position hinge may just prove to be a luxury instead of a necessity.

Connectivity-wise, the Surface 3 still offers only one USB 3.0 port and a single mini-DisplayPort output on its right edge. Microsoft has also replaced the reversible charging port on the Surface Pro 3 with a more conventional microUSB port. This was a good decision – microUSB adds to the broader, mass-market appeal of the Surface 3 and you no longer have to shell out $108 for a proprietary plug and charger should you lose it.

When it comes to accessories, the Surface 3 can be paired with a smaller and much-improved Type Cover keyboard that costs $199. The Surface Pro 3's Type Cover keyboard was good, but one gripe we had with it was its shallow key travel and slightly mushy feel. The new keyboard improves on this with farther key travel distance that makes for a better and more tactile typing experience.

However, we were disappointed to find that the Surface 3 isn't bundled with the Surface Pen – it needs to be purchased separately for $73 – but that's probably another way for Microsoft to keep costs down.

On the battery front, the Surface 3 is an absolutely stellar performer. It lasted 309 minutes while handling a variety of video editing, gaming and productivity tasks, a whole two hours longer than the Surface Pro 3. Power consumption is also excellent, coming in at just 5.44 watts. Furthermore, it posted an excellent portability index of 8.427 even with the Type Cover attached, beating Apple's new MacBook.

If you look just at the performance benchmarks, the Surface 3 may appear to be quite a poor performer that trails most Ultrabooks and 2-in-1 hybrids out there. However, it is in fact quite a competent device in a real world where numbers don't matter as much as its intended usage function. The Surface 3 may be casual in nature, but is still a robust and highly portable device for productivity and internet applications.

by *Koh Wanzi*

TESTED & RATED
8.5/10

HWM
SINGAPORE

SMARTWATCH RELOADED

Pebble Time

AT A GLANCE

Display
1.25-inch color e-paper, LED backlight

Battery
Li-ion polymer, up to 7-days per charge

Connection
Bluetooth 4.0 LE

Dimensions
40.5mm x 37.5mm x 9.5mm (case), 22mm (band)

Weight
42.5g

Price
US$199

The original Pebble was the highest backed Kickstarter campaign in history at US$10 million, a record broken only three years later by none other than its own successor, the Pebble Time, which raked in US$20 million in pledges. By the time you read this review, the initial 10,000 backers would have gotten their watches and public pre-orders started. So, if you missed out on the whole Pebble smartwatch craze the first time around, should you be jumping all over the Pebble Time?

For starters, it is more compact than the original Pebble and build quality has greatly improved; the case is still polycarbonate, but the bezel is stainless steel. It also has a microphone now, but functionality out-of-the-box is limited as app developers will have to specifically make use of it. Water-resistance may have decreased from 50 meters to 30 meters, but the Pebble Time is actually tested and rated according to the newer ISO 22810 standards, where a watch must be able to operate at its actual rated depth without leaking. This is in comparison to the old ISO 2281 standard, where a 30 meter/3ATM rated watch would in reality only survive light splashes and sweat. I've gone swimming with the Pebble Time and it continues to work like a champ.

The biggest selling point of the Pebble Time is its new color e-paper display, where the original Pebble was only monochrome. Even with the color upgrade, it matches the Pebble by being always-on and still boasting up to seven days of battery life per charge. Throughout the course of this review, I was extensively using the Pebble Time, installing watch faces, apps and navigating through its many functions. From Saturday through Monday, the battery only drained from 90% (straight from the box, I did not charge it at any point through this review) to 50%.

The e-paper display is quite dim though. Yes, it is always on. Yes, it works quite well outdoors under direct sunlight. But, the Pebble Time's display looked muddy and dull indoors, even when compared with the original Pebble and with its LED backlight enabled. Speaking of which, you're also unable to change the duration of the backlight. Its halo feature may just end up being its worst Achilles' heel.

The second major improvement is its

The Pebble Time features fun little animations as part of its new Timeline UI, adding some geek chic, but it's not business friendly like the Pebble Steel.

The Pebble Time has a microphone that app developers can make use of, but it does not natively support smartphone OS functions like Siri or Google Now.

CONCLUSION

Upgraded in every aspect with the best battery life bar none, but let down by a dull display and true potential that's yet to be realized.

overhauled operating system, called Timeline, where Pebble introduces a novel way for app developers to directly interact with the watch. Say you want to check out the latest sports scores, your to-do list for the day and weather information; having to open three different apps isn't exactly intuitive on a small 1-inch screen on your wrist. Timeline allows apps to post updates as specific pins on a flowing time line. Pressing the top right button scrolls back in time and pressing the bottom right button scrolls forward. There are only a few apps that properly support Timeline at the moment, but with the SDK and watches out, expect this to grow.

At its recent WWDC, Apple also announced a similar feature in its next version of watchOS for the Apple Watch called Time Travel, where scrolling the digital crown back and forward will show you updates on past and future events. Because of

this, there is one less unique feature that the Pebble Time has going for it as the Apple Watch suddenly becomes the smartwatch to beat.

Now, while the original Pebble was hobbled by a restrictive user interface with severe limitations on the number of apps and watch faces that you could install, the Pebble Time feels infinitely more modern and seamless. You still need to get the Pebble Time app on your phone and app configuration is done there. When it reaches its memory limit, earlier apps will be unloaded, though it will still be listed on the watch. As long as your watch and phone are connected, selecting an unloaded app will automatically re-load it back from your phone. As a quick note, the Pebble Time app needs iOS 8+ and Android 4.0+ because it uses Bluetooth 4.0 for connectivity.

Last and perhaps most important, the Pebble Time

features a smart accessory port on its rear. This is the same charging port, but Pebble has made it possible for third party smart straps to extend the functionality of the base watch with add-ons like GPS modules, heart rate monitors or cellular antennas. The possibilities are endless. While it is impossible to judge the success of this endeavor at this early stage, the Pebble Time introduces the concept of modular smartwatches that can evolve with need, and that's a really big deal, just not at the moment.

by *Zachary Chan*

TESTED & RATED

7.5/10

HWM
SINGAPORE

THE UNSHAKABLE TRUTH

Olympus EM-5 Mark II

AT A GLANCE

Sensor
Micro Four Thirds

Megapixels
16.1

Dimensions
123.7mm × 85mm × 44.5mm

Weight
417g (body only)

Price
$1,398 (body only),
$1,998 (14-150mm lens)

This lever switches between two groups of functions assigned to your main dials.

Given the popularity of the original Olympus OM-D EM-5, it's really no surprise that the OM-D EM-5 Mark II has been one of the most anticipated cameras of the year. But how do you add more to a camera that already did so much? Well, in Olympus' case, they decided to focus on improving on all the aspects that lead to greater image quality like high ISO performance, color accuracy, autofocus speed and accuracy and image stabilization.

At first glance, you'd be hard pressed to tell the difference between the original OM-D EM-5 and the new Mark II. With the exception of larger dials and some slight changes to the proportions of the body, the EM-5 Mark II retains largely the same design as the original, which isn't a bad thing. The grip is slightly larger than before, and the camera feels extremely solid as though it was made from a single piece of metal.

Buttons and dials are more responsive than what was found on the original EM-5, and there are now even more custom function buttons available to repurpose: four dedicated Fn buttons (from 1 to 4), the movie REC button, the Preview button, and even the Down and Right buttons on the four-way directional controller can be reassigned.

Also unique to the EM-5 Mark II, is the way it uses a 2x2 control lever to switch the functions assigned to the main control dials. For example, you can assign that on Position 1 of the lever, your front and rear dials adjust shutter and aperture, while Position 2 causes them to adjust ISO and WB instead. There are multiple modes that you can set the control lever to, thus giving you even more options to configure the camera exactly the way you need it.

The rear LCD now flips out and is fully articulated, allowing for great flexibility in usage, as you can now have the camera in literally every position imaginable and still be able to compose via the LCD screen. Also, the quick menu now brings you to Super Control Panel mode by default, placing all the settings literally at your fingertips.

In terms of capture performance, the biggest difference comes in the form of the improved 5-axis in-body image stabilization. It will work for both still capturing and movie recording mode, and Olympus claims it now gives you up to five stops of compensation, or the equivalent of allowing you to shoot at about 1/2 second indoors. This was a bit of an oversell with still images, as the best we could manage was 1/13 second, but it certainly worked wonders recording video.

We did a rough test with the EM-5 Mark II and another camera that didn't have in-body stabilization, recording

This image was shot handheld at 1/13 second thanks to the 5-axis image stabilization.

CONCLUSION

A minor upgrade to an excellent camera, with interesting new features that make it more appealing for shooting video.

video with both cameras while we walked, ran and simula ted being bumped by lightly jumping on the spot. Compared side to side, the footage from the OM-D EM-5 Mark II was noticeably much more stable and definitely more watchable, thus in part justifying Olympus' decision to leave out 4K recording capabilities.

The other new feature is the 40-megapixel High Resolution mode, where the camera builds up a high resolution image by taking eight consecutive frames, shifting the sensor slightly each time. The first four frames move the sensor so that all colors are captured at the existing positions, while the next four frames are captured by shifting the sensor slightly up and to the left each time. The camera compensates for the overlap

and outputs a 40-megapixel image as the final result.

It certainly seems like a novel way to get over the perceived limitation of using a 16-megapixel sensor, but in practice is limited to very specific applications as both the camera and the subject have to remain perfectly still during capture. That essentially means the camera has to be tripod mounted, and your scene must not have moving elements, or you'll get either motion blur or hand shake in your images.

Overall, the image quality from the OM-D EM-5 Mark II is very good, with RAW files that have as much latitude (relative to sensor size) as some of the current APS-C sized sensors, however it isn't significantly better than the original OM-D EM-5, which

means it doesn't quite stand out as much compared to the competition, which in fairness has really improved over the years.

Ultimately, its biggest strength remains the improved 5-axis image stabilization, so if you're not doing a lot of video work and you're already an EM-5 owner, you may want to wait for the eventual successor to the E-M1 before upgrading.

by *Marcus Wong*

TESTED & RATED

8.0/10

HWM
SINGAPORE

THE HANDY POCKET DO-IT-ALL

Panasonic Lumix DMC-GF7

AT A GLANCE

Sensor
Micro Four Thirds

Megapixels
16.1

Dimensions
106.5mm x 64. 6mm x 33.3mm

Weight
236g (body only)

Price
$699 (with 12-32mm f/3.5-5.6 ASPH lens)

Tap up on the control dial to toggle between adjusting your shutter speed and aperture.

The DMC-GF7 is the sixth generation of Panasonic's entry-level compact system camera line, and a large part of the marketing spiel around the camera seems to be about making it "the ultimate in ease of use" for any photographer. This means of course, a variety of shooting modes for every situation and, in keeping with the trend, new selfie modes that let you take hands-free selfies, as well as a tilting 3-inch 1,040k-dot touchscreen LCD that flips up 180-degrees.

The Lumix DMC-GF7 continues with the trend of classic retro-styled compact system cameras (CSC) and is even smaller than the Lumix DMC-GF6 it replaces, weighing just 266g. That makes it one extremely pocketable camera and the 12-32mm f/3.5-5.6 lens folds away nicely to complement that.

There isn't much of a grip on the Lumix DMC-GF7 compared to the DMC-GF6 though, but the faux leather covering on the body seems to provide just about enough texture for a decent hold. This is quite an important consideration due to the small size of the camera, but overall, it does feel solid in the hands.

The controls have a good textured feel and despite the lack of physical real estate, there seems to be just enough spacing to the buttons that you can access them comfortably.

In line with the idea of making the camera easy to use, there's also a dedicated iAuto button that puts the camera into Intelligent Auto Mode, which changes all the settings for you based on what it detects of the scene in front of you. Do note that it will override any mode that you're previously in, and will stay activated until the iAuto button is pressed again.

Tilting the screen up puts the camera in selfie mode and gives you a new set of options to choose from – there's soft skin effect for skin smoothing, defocus effect for the bokeh look, slimming mode, and you get a range shutter activation

PICTURES PANASONIC

The Lumix DMC-GF7 gives impressive detail at the lower ISOs.

CONCLUSION

Small and compact with great looks and features, the Lumix DMC-GF7 makes for a great everyday camera.

options. Choose between Buddy mode, which takes a picture when the camera detects two faces are close together, or Face detect mode, which asks that you put your hand in front of your face first, then activates the shutter when it's moved away. You can also set the number of shots to take (from one to four) and the length of the countdown (three or ten seconds).

We like that there's an on-screen drawer that provides quick access to five custom functions, and also that the camera allows you to use the control dial to physically adjust both shutter and aperture (even if you have to press a button to switch between functions). This is all activated by touch, adding another layer of control that further cuts down on menu diving required.

Built-in Wi-Fi means you can also pair the camera to your smartphone via the Panasonic Image app, allowing you to expand shooting capabilities. We like the interface of the app, as it gives you a live view of

what the camera is seeing, and allows you to change practically every shooting setting on the camera.

There's even a jump shot function which sets the camera to detect movement, hence triggering the shutter. There's five levels of sensitivity to best match the type of jumping you intend to do, so that's certainly something unique to the camera to look into.

The Lumix DMC-GF7 is powered by a 16-megapixel Micro Four Thirds Digital Live MOS sensor paired with Panasonic's Venus Imaging engine. This combination makes the Lumix DMC-GF7 extremely responsive. It starts up in less than half a second, and the LCD blackout between shots is very much negligible.

In our testing, we found the camera to be very responsive. Autofocus is fast and accurate, and the buffer of the camera clears almost fast enough for you to be shooting continuously at just under five frames per second until your card fills up. Images captured have

good color and contrast, and there's an impressive amount of detail captured when you stop down the lens towards f/11.

The in-body image stabilization allowed us to take images handheld at about 1/10 second, and the new Low Light AF function in the Light Speed AF system meant we were still able to get autofocus quickly despite the poor lighting conditions due to the overcast weather. While the camera goes up to ISO 25,600, we'd recommend sticking to ISO 6,400 and below as detail tends to get lost at the extreme sensitivities.

by *Marcus Wong*

TESTED & RATED

8.0/10

HWM
SINGAPORE

FASHIONABLE FITNESS

Fitbit Surge

AT A GLANCE

Display
1.25-inch monochrome LCD

Battery life
Up to 7 days

Water resistance
Up to 5ATM

Price
$349

The Surge has an integrated heart rate sensor, but we found it to be inaccurate.

CONCLUSION

Iffy heart rate sensor aside, the Surge is an affordable alternative to full-fledged GPS fitness watches.

TESTED & RATED

8.0/10

HWM
SINGAPORE

Fitbit calls the Surge their super fitness watch, which should give you an idea of what this watch is all about. On a very basic level, one could call the Surge Fitbit's flagship watch. It is the largest and packs the most features.

To begin, unlike the Charge and Charge HR, the Surge has a sizable 1.28-inch monochrome touchscreen LCD display. As a result, it also looks more watch-like than the Charge and Charge HR. It has an integrated rubber strap that is non-changeable. Fortunately, the strap is soft and comfortable on the skin.

The Surge can do everything that the Charge and Charge HR can, which means it can track the number of steps you take in a day and also monitor your sleep. Like the Charge HR, the Surge also has an integrated optical heart rate sensor. Unfortunately, we found the heart rate sensor to be unreliable as it tended to give readings that were lower than what they should have been.

The key differentiator of the Surge is that it has an integrated GPS and specialized exercise modes such as running and hiking. Using the integrated GPS, the Surge can give you real-time information about your pace and heart rate; and can also map out your exercise route for review afterwards. If you are exercising indoors, the Surge has you covered too and has modes for yoga, treadmill running, workout and more.

Your exercise performance can be reviewed either using the Fitbit app that is available on iOS, Android and Windows Phone devices. If you prefer to review your performance on a larger display, there is also a Fitbit desktop app for both PCs and Macs.

Battery life is usually a concern for wearables, but that is not the case for the Surge. In our experience, we found the Surge to last about four to five days on a single charge. The GPS drains the battery considerably, so your mileage will vary depending on how much and how long you enable the Surge's GPS.

Overall, the Surge is a decent fitness activity tracker with an in-built GPS and multiple exercise modes. Unfortunately, heart rate accuracy is still a problem that Fitbit needs to address across its products. Then there's the issue with its 50m water resistance. It's sweat and splash proof, but not for swimming. Showering is also not recommended.

by *Kenny Yeo*

THE COST-EFFECTIVE CONTENDER

Gigabyte GeForce GTX 960 Windforce 2X

AT A GLANCE

GPU Transistor Count
2.94 billion

Core Clock
1,216MHz

Memory
2GB GDDR5

Memory Clock (DDR)
7,012MHz

Price
$359

The two 90mm fans feature raised ridges and a unique design that help deliver stellar cooling performance.

CONCLUSION

The Gigabyte GeForce GTX 960 Windforce 2X is an affordable, silent and cool GeForce GTX 960 contender.

While the NVIDIA GeForce GTX 960 has already established itself as a card for the masses, this particular Gigabyte card aims to offer even more value for what is already a very cost-effective base card. It distinguishes itself primarily by virtue of its stellar cooling performance – its two-fan Windforce cooler and four 6mm heatpipes deliver chilly temperatures that beat out the offerings from other manufacturers.

In our temperature tests, the card peaked at a cool 52°C, outperforming even the triple fan Gigabyte GeForce GTX 960 G1 Gaming. With such performance, it's worth taking a closer look at the fans, which sport an 11-blade design and unique striations running across its middle. These take the form of five raised ridges and a triangular protrusion, which Gigabyte says helps split air that passes over the fans and guide it smoothly through the fan.

The card comes with two performance profiles: Gaming mode and OC mode. It is set to Gaming mode straight out of the box, with a GPU base clock of 1,216MHz and boost clock of 1,279MHz. In OC mode, the card ramps up slightly to a 1,241MHz base clock and 1,304MHz boost clock. Its 2GB of GDDR5 memory is clocked at 7,012MHz.

The Gigabyte card performs decently in our synthetic and gaming benchmarks, coming in roughly on par with its counterparts on the market. It proved itself quite capable of delivering a playable experience of Crysis 3 at Ultra settings with anti-aliasing turned off – 38.9fps should satisfy all but the most demanding gamers.

In addition, the card is a fairly handy overclocker as we were able to push the base clock speed up to 1,391MHz, which translates into a boost clock of 1,454MHz. Its memory modules were also overclocked to a high of 7,652MHz.

While the two-fan Windforce card may fall behind its higher clocked counterparts – albeit by a slim margin – in our gaming tests, it more than makes up for it with stellar overclocking performance. In 3DMark Fire Strike, we measured just under an 11% increase over its stock performance, a fairly hefty boost that's achieved with just a few tweaks.

Appearance-wise, the card features the distinctive stealth black color scheme of the current generation of Windforce coolers, complete with subtle contours and angles to break the monotony of the cooling shroud. Its minimalist looks and great value offering will be right at home in any mainstream gaming case.

by *Koh Wanzi*

TESTED & RATED

8.0/10

HWM
SINGAPORE

NOVELTY FLAGSHIP

Huawei P8

AT A GLANCE

OS
Android 5.0 Lollipop with Huawei's EMUI 3.1

Processor
HiSilicon Kirin 930 octa-core processor (Quad-core 2 GHz Cortex-A53 & quad-core 1.5 GHz Cortex-A53)

Display
5.2-inch 1,920 x 1,080 pixels (424ppi) IPS LCD

Storage
16GB internal storage (microSD support up to 128GB)

Price
$699

The P8 has an interesting square-shaped power button.

At just 6.4mm, Huawei's newest flagship smartphone, the P8 (they've dropped the Ascend name), is one of the thinnest phones out there. Compared to last year's P7, the P8 looks a bit more squarish, with the curved edge along the bottom of the P7 now gone. On the front of the phone, thin bezels have allowed Huawei to pack a 5.2-inch Full HD display into a pretty compact-sized phone, and the P8 actually boasts one of the best screen to body ratios around, at 78.3 percent. The squarish design is echoed in the square power button, which can be found on the right-side of the phone. Over here, you'll also find the volume rocker and slots for the nano SIM card and microSD card slots (which also doubles up as a second

nano SIM card slot).

On the bottom of the phone, you'll find the micro-USB port and the P8's dual speakers. Huawei has put some effort into making the P8 a decent audio player, and it boasts an on board Hi6402 DSP for improved audio quality.

The P8 is armed with a 5.2-inch, 1,920 x 1,080 pixel resolution IPS-LCD display, giving it 424ppi, which is actually a slightly lower pixel density than its smaller-screened predecessor, the 5-inch P7 (445ppi). Nevertheless, picture quality is still very crisp, with vivid colors and excellent viewing angles. Contrast could perhaps be slightly better and the blacks aren't as deep as they could be, appearing slightly bluish with the lights off, but this is a problem shared by all LCD

displays.

The P8 runs on Android 5.0 Lollipop with Huawei's EMUI 3.1 over the top of it. As with many Chinese smartphones, the UI removes the app drawer in favor of all apps being displayed on a series of home screens, similar in style to iOS.

The most interesting thing about the P8 is the sheer number of oddly specific features it boasts. For example, it has an automatic international dialer that removes the hassle of remembering international country codes. There's also a "Loud mode" for taking phone calls in noisy areas. One feature that we can't get our heads around is Knuckle Sense. Huawei claims it has developed a new input system that can recognize

The phone is available in four colors: carbon black, titanium gray, mystic champagne and prestige gold.

CONCLUSION

The Huawei P8 still hasn't quite reached the flagship performance of competing brands, but it continues to make progress every year.

the difference between your finger and your knuckle, thereby opening up new functions and input shortcuts. For example, double tap the screen with your knuckle and you can take a screenshot, or draw a rectangle with your knuckle to crop a picture. If that sounds awkward to use, it's because it really is. You can't do it one-handed and the recognition itself is a bit of a hit or miss. It works when I use my thumb or middle finger knuckle, but not my index finger, and it occasionally thinks I'm using my knuckle when I'm actually using my finger, taking unwanted screenshots. At times, I wish I could turn it off entirely (after all, how often do you take screenshots), but unfortunately that doesn't seem to be an option.

The P8 is powered by an in-house HiSilicon Kirin 930 octa-core processor that Huawei says is 80 percent faster than the P7's Kirin 910. Strangely enough, Huawei is using an

ARM Mali-T628 GPU, which was released way back in 2012. Unfortunately, in our benchmark tests, the P8 was quite disappointing, and only managed about 50 percent of the HTC One M9's scores. Battery life was also underwhelming, lasting just under seven and a half hours on our video looping benchmark.

The P8 is armed with a 13-megapixel shooter, equipped with a number of innovative camera technologies. First up is the P8's "best in class" 1.2-degree optical image stabilization. Next, the P8 has the world's first four-color RGBW (red, blue, green and white) imaging sensor, which Huawei claims is able to more accurately capture a wider range of colors than traditional RGB sensors. Finally, the P8 is armed with a DSLR-grade independent image processor, aimed at improving automatic scene recognition, providing more natural colors and more balanced exposure.

Actual image quality was

a bit of a mixed bag though. On the one hand, color reproduction was quite good and, thanks to the optical image stabilization quite sharp too. In good light the camera definitely performs well but it struggles a bit indoors and is noticeably grainy in non-ideal lighting conditions.

At $699, the Huawei P8 is very affordable for a flagship smartphone. For that price you're getting a premium, slim and lightweight build, with a sharp 5.2-inch Full HD display and a decent camera. However, anyone into heavy mobile gaming may want to look elsewhere.

by *James Lu*

TESTED & RATED

7.5/10

HWM
SINGAPORE

SIREN SONG

Razer Seirēn Pro

AT A GLANCE

Sample rate
192kHz

Bit rate
24-bit

Capsules
Three 14mm
condenser capsules

Frequency response
20Hz – 20kHz

Sensitivity
12.5mV/Pa (1kHz)

Max SPL
120dB
(THD: 0.5% 1kHz)

Price
$389.90

Accessories available for the Seirēn Pro include a shock mount and pop filter (both sold separately).

CONCLUSION

While definitely on the pricy side, the Razer Seirēn Pro offers great build quality as well as excellent audio.

TESTED & RATED

8.0/10

HWM
SINGAPORE

The Razer Seirēn Pro is, as the name suggests, a 'pro' version of the Seirēn condenser microphone released last year. The main difference is the inclusion of a high-pass filter to remove low-end ambient noises such as computer hum. The Pro also gives users the option of recording via an analog XLR or through digital USB connection. The XLR cable allows the Pro to be plugged directly into mixing boards and cameras, and you can even chain together multiple microphones and instruments to the board with the XLR option, with increased flexibility for adjustments on the fly during live sessions.

Design-wise, the Pro looks much the same as last year's model, with a large black anodized aluminum body and an aluminum desk stand. Incidentally, if you prefer a mount, Razer sells a Shock Mount for the Seirēn for $69.90. The main body of the microphone also has an LED-lit Razer logo in Razer's signature green color that faces away from the user (but towards a camera when recording).

Below the Razer logo are two dials: one to control gain of the mic and one the pattern used to pick up sound. The Seirēn can utilize four patterns, using the three 14mm condenser capsules inside: Cardiod for general voice work such as streaming and podcasts, Stereo for instruments and vocals, Omnidirectional for conference calls and Bi-directional for interviews or duets.

On the side of the mic that faces you, there's an OLED display that shows what pattern is in use, as well as the level for the last used dial: either gain or the headphone output dial located directly below the display. Below the headphone output dial, there's a mute button.

Annoyingly, Razer requires installation of its Synapse software when setting up the Seirēn. Once installed, the Synapse control panel lets you control bitrate and sample rate. If you don't need these, you can safely uninstall the software, leaving the driver in place and the mic fully functional.

Sound quality on the Seirēn Pro is very good, with crisp sound, a fairly neutral profile and lots of detail. If there's one thing the mic could do better at, it's background noise reduction. Despite the high-pass filter, the mic still easily picks up fan noise, keyboard typing and clothes rustling, which can potentially ruin a good recording.

by *James Lu*

PICTURES **RAZER**

The NVIDIA GeForce GTX 980 Ti has three DisplayPort connectors, one HDMI port and one dual-link DVI port at its rear.

CONCLUSION

The GeForce GTX 980 Ti's performance rivals that of the Titan X, and its lower price makes it a great option for 4K gaming.

NEARLY A TITAN X

NVIDIA GeForce GTX 980 Ti

The NVIDIA GeForce GTX 980 Ti is based on a pared down version of the same GM200 GPU on the Titan X. It features 22 SMM units and 2,816 CUDA cores, down from 24 SMMs and 3,072 CUDA cores on the Titan X. It also has slightly fewer texture mapping units, 176 versus the Titan X's 192.

However, it does have the same 384-bit memory bus width and boasts a hefty 6GB of GDDR5 memory, which should deal handily with memory-hungry 4K gaming and virtual reality applications.

In 3DMark 2013's Fire Strike Ultra 4K benchmark, the GeForce GTX 980 Ti scored within 4% reach of the faster Titan X. In Middle-earth: Shadow of Mordor, there were just a few frames of difference between the two cards. For instance, the 980 Ti posted 27.5fps versus the Titan X's 28.5fps in the 5,120 x 3,200 benchmark.

And because it sports the same reference cooler as the Titan X, both cards performed quite similarly in our temperature and power consumption tests. We recorded a peak temperature of 82°C for both cards. Idle power consumption came in at 150 watts and consumption under load peaked at 425 watts – again, there's little to differentiate it from the Titan X here.

Take note that the GeForce GTX 980 Ti has a 250 watt TDP and requires two six-pin and eight-pin PCIe connectors to power it.

In addition, the GeForce GTX 980 Ti overclocked quite well. After applying an overvolt of 24mV, we achieved a base clock of 1,227MHz and a boost clock of 1,303MHz. This is up from the stock speeds of 1,000MHz base clock and 1,075MHz boost clock. This resulted in a 6% increase in performance in 3DMark Fire Strike, which widened to 11% in Fire Strike Ultra. The card may be so powerful that it is running up against a performance plateau at lower resolutions. Instead, it requires more demanding 4K resolutions to see the real benefit of its overclock.

While the new card is intended to fill the gap between the NVIDIA GeForce GTX 980 and Titan X, it does more than occupy the middle ground and is literally knocking at the door of the latter. And at US$649, it may just jeopardize sales of the Titan X.

by *Koh Wanzi*

TESTED & RATED

8.5/10

HWM
SINGAPORE

POWER WITHOUT THE BULK

Boostcase for iPhone 6/6 Plus
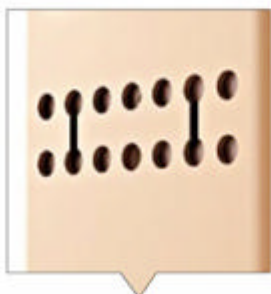
AT A GLANCE

Battery Capacity
2,700mAh

Colors
Black, Gold, Clear

Weight
110g/132g
(iPhone 6/6 Plus)

Price
$129

Mounting holes on the snap case could have potential for other accessory add-ons besides a battery pack.

CONCLUSION

Modular design makes it very practical to use, but either battery capacity has to go up or the cost has to come down to be competitive.

TESTED & RATED

7.5/10

HWM
SINGAPORE

Smartphone cases are a dime-a-dozen and I will tell you straight, it's pretty hard to get noticed these days unless it has some kind of ace up its sleeve. The Boostcase is one such case. I had recently switched over to an iPhone 6 and needed to travel, so I took the opportunity to give it a try. Now, battery cases are usually bulky, a necessary evil that ruins the slim aesthetics of your phone. The Boostcase solves this problem with a modular two-part design comprising of a slim plastic snap cover and a detachable battery attachment.

Genius. Now, I could be wrong, but it is the first of its type to come across my desk. Imagine a whole range of standardized accessories from lens attachments to additional storage that can be easily and securely snapped on as needed. This in contrast to having a jumble of gadgets of various sizes all jangling around in my bag.

Now, the Boostcase comes in three colors: black, gold and clear. I recommend the gold. The snap case portion is quite basic with a smooth finish. It snaps on securely and is thick enough that it feels like it would do a decent job with accidental bangs. The case covers the sides and corners, but the top and bottom are exposed.

On the rear, there are two rows of perforated holes, which are equally decorative as well as functional. Besides providing some extra grip, there are mounting slots used to secure the battery attachment. You only need to attach the battery when your phone requires charging; the other 90% of the time, you will only have the slim snap case on, which is the beauty of the Boostcase.

The battery pack itself features an on/off switch, so you can have it attached all the time if you prefer to do so without it constantly trying to charge your iPhone. It is in turn charged via micro USB and has a nifty touch activated LED indicator bar to show how much charge is left.

The biggest issue is that only the 2,700mAh version is sold locally (a 4,500mAh iPhone 6 Plus version is available on its website). It will provide at least one full charge, but with cheap, high-powered battery packs such as the $30, 16,000mAh Xiaomi Mi Power Bank available, it's very difficult to drop $129 for the Boostcase, modular or otherwise.

by *Zachary Chan*
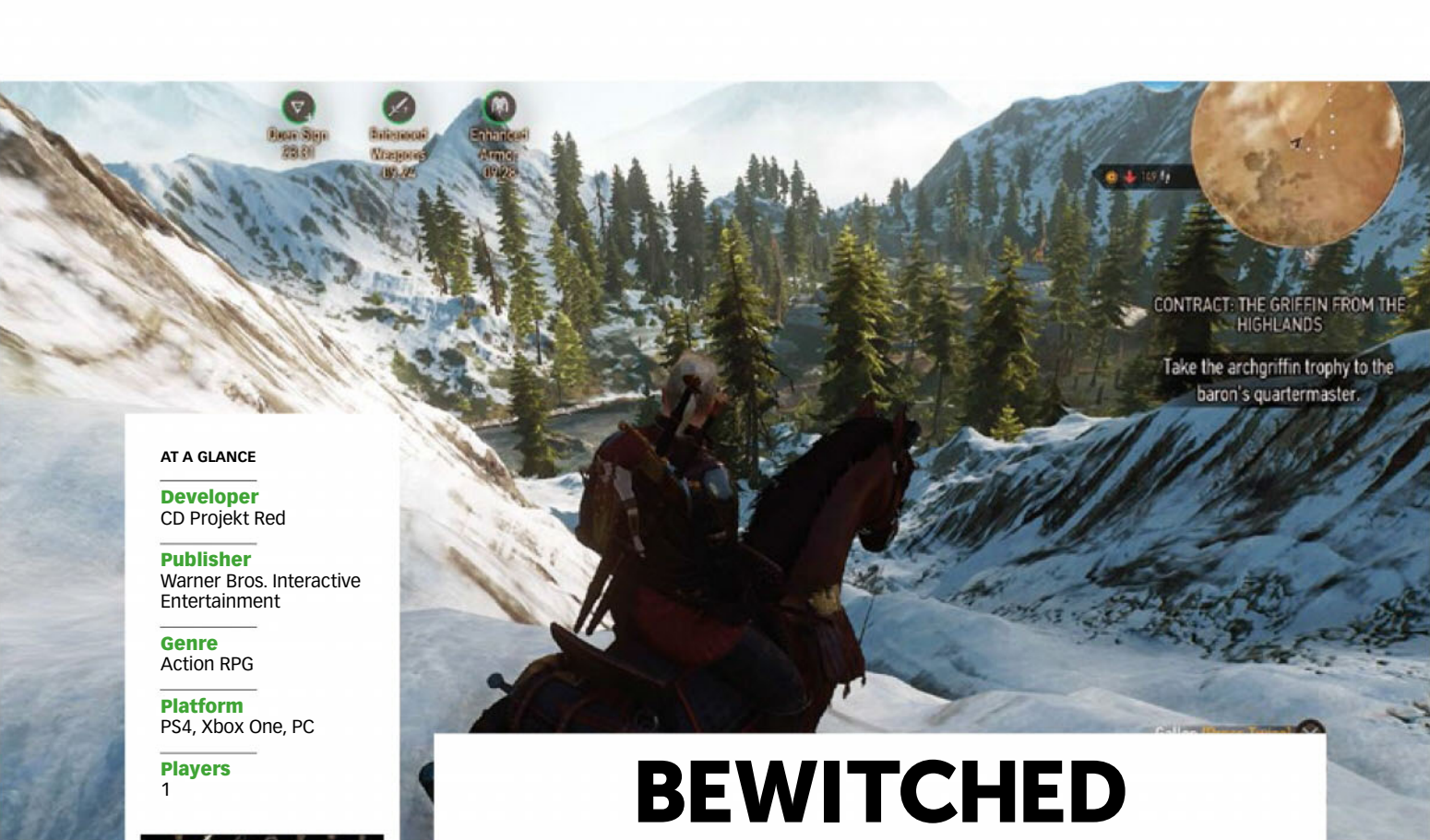
CONTRACT: THE GRIFFIN FROM THE HIGHLANDS
Take the archgriffin trophy to the baron's quartermaster.

BEWITCHED
The Witcher 3
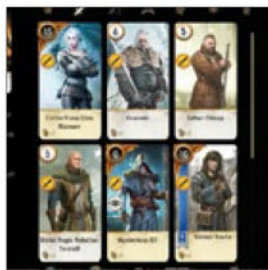
Gwent is a trading card game that players can participate in. You find and collect cards in-game and to play, simply lay down cards and see who has the bigger value at the end of a round.

CONCLUSION

The Witcher 3 is the best RPG on a current generation console right now, which makes it definitely a game that needs to be played.

The Witcher 3 is the latest game in the Witcher trilogy, centered on a wandering monster hunter named Geralt. Playing The Witcher 3 is not unlike watching a good movie; you don't want to see it end. Doing all the side quests and contracts will allow you to get a feel for the world, something you won't gain from just rushing through the story. Most secondary missions tend to flesh out the main story, with specific dialog and choices affecting the main story.

With huge maps to explore, the world of the Witcher 3 is akin to Skyrim in aspects. There's something new to discover everywhere you go. Some of them don't even show up on the main map. So if you want to see everything, expect to do lots of personal exploration. The sense of exploration is second only to Skyrim, as the Witcher 3 oddly is lacking in caves and dungeons that aren't integral to the main quest or secondary missions.

There are some gameplay issues that can hamper your experience a little, such as combat hit detection, where visually connected blows are not registered by the game. We also have a little gripe with Geralt's weirdly lethargic animations for what is supposed to be a quick attack, which leads to enemies getting in some cheap hits during fights.

Even on a PS4, the game taxes the system quite a bit, so expect frame rates to get choppy when there's plenty of action going on. When this happens, even the most basic of actions become sluggish. As an advanced warning, you'll experience this the most in the parts of Valen with swampy marshlands.

While it's true that the final game doesn't look much like its stunning E3 demo reveal - most probably toned down from the original expectations of PS4 and Xbox One performance - it is still one of the best looking games out on consoles. Faces in particular are amazingly detailed, which

is great considering the game goes into close-ups whenever you talk to somebody. Voices are pretty decent too, though the deadpan delivery of Geralt does tend to get annoying at times.

As an open RPG, the Witcher series contiues to be one of the best in the genre and the Witcher 3, one of the best games on the PS4 now. Even the Gwent mini game alone is an excellent time sink. It has all the things you'd want in a great game and then some. If you're looking to kill someone's social life, Witcher 3 will be our top recommendation.

by *Salehuddin Husin*

TESTED & RATED
9.0/10

HWM
SINGAPORE

WORK FOR HIRE
Clear Infestation

COMPLETED: Seek and Destroy
Paid for our trouble.
+5   ⭐+5   ☺+10

AT A GLANCE

Developer
Undead Labs

Publisher
Microsoft

Genre
Open World RPG/
Simulation

Platform
Xbox One, PC

Players
1

STATE of DECAY

INCLUDES

If you own the original game on the Xbox 360, you get a discount if you buy the Xbox One version.

CONCLUSION

Get the PC version if you can. It has all the content, none of the technical issues.

YOU'VE TAKEN A LOT OF DAMAGE, REDUCING YOUR MAXIMUM VITALITY.

DANGER! DEAD INSIDE!

State of Decay: Year Old Survival Edition

State of Decay was originally launched for the Xbox 360 in 2013. It was a pretty good game, rough around the edges (tons of bugs, stilted animation) but it was undeniably fun. This Xbox One version is a compilation of the original plus expansion packs.

State of Decay is an open world, survival game with zombies. Breakdown is a military themed expansion set in another town. Guns come into play more in Breakdown since you're leading a platoon of soldiers but for the most part, gameplay is similar though you can request supplies from HQ to help out. Lifeline is the other expansion included on the disc, though it's mainly a survival mode of the original without a storyline, which isn't too compelling.

Since the game was originally an Xbox 360 title, one would reasonably expect improvements and optimization for the Xbox One compilation. That's not the case.

The weird animations present in the original still haven't been polished. It's still disjointed and cartoony as ever. But that's the least of the game's problems. Frame rate stuttering is still as bad too. It's nowhere near a constant 30fps, though at times it can jump higher than that.

There are also a multitude of bugs (in all three modes), but the biggest one has got to be the clipping issue. Zombies routinely pass through closed doors and walls with no issues, which defeat the purpose of building defenses.

The visuals have taken a bit of a step up though; miscellaneous effects like sun rays shining through gaps in the trees have been added. They do spruce up the game a bit but it doesn't hide the fact that the game still looks as it did on the Xbox 360. Textures are still muddy and dark, there's a weird sheen to indoor objects, there's horrible pop-in of zombies on both locations and zombies lack variety. It's basically the same thing with the audio. Everything is lazily reused from the Xbox 360 version.

It's a shame really, as the core gameplay buried under the issues is really fun. There's tons of content to play through and most of it is enjoyable but the technical issues will undoubtedly alienate new gamers on the Xbox One version thinking that it's a polished product when it's not.

by Salehuddin Husin

TESTED & RATED

5.0/10

HWM
SINGAPORE

ANYTHING CAN HAPPEN
IN THE NEWSROOM, ESPECIALLY
AT A TIME WHEN TECHNOLOGY IS
REINVENTING MEDIA. IT'S INSPIRING
TO WORK WITH A YOUNG AND
GUNG-HO TEAM, WHO
CONSTANTLY CHALLENGES AND
IMPROVES THE WAY WE PRODUCE
AND DISTRIBUTE VIDEO.

Jonathan Ng
EDITOR
SPH RAZOR

PEOPLE
WITH
PASSION

sph

VISUAL AID: A VIRTUAL REALITY PRIMER

AS TECHNOLOGY MOVES FORWARD, SO DO METHODS OF INTERACTION. WHERE WE ONCE INTERACTED WITH COMPUTERS USING CARDS, IT EVOLVED INTO INPUT TERMINALS, KEYBOARDS, MICE AND TOUCH SCREENS. SOON THOUGH, THAT TRADITIONAL MAINSTAY WILL BE REPLACED BY SOMETHING COMPLETELY DIFFERENT. IN FACT, YOU CAN EVEN SAY IT'S A WHOLE DIFFERENT REALITY!

Text by *Salehuddin Husin* Art Direction **Ken Koh**

An American computer scientist named Jaron Lanier coined the term Virtual Reality (VR in short) in 1987, but VR existed long before that. In fact, the idea of a simulated environment with a HMD (head mounted device) existed in the 60s. It was only in the 80s though where VR entered the modern day lexicon, as the media became interested in what it could do. This fascination with VR eventually gave us early 90s movies like the Lawnmover Man and Johnny Mnemonic where VR is depicted as a realm where everything is possible. Hollywood depictions of VR often go into the realm of science fiction, featuring cranial implants that directly interact with our brains; the plots of Johnny Mnemonic and the Matrix great examples of this. The truth is real VR is often crude and unwieldy, with archaic graphics and monstrous headsets. That's changed in recent times, but Hollywood's gloried image of VR still hasn't.

Today, there are many different branches of visual enhancement technologies all being developed at the same time from 3D to VR to AR, and they can come in the form of cheap DIY visors to purpose-built proprietary rigs. It's impossible to nail down a 'main' branch of VR, but it is coming nonetheless, so we've put up a primer on everything you need to prepare for the future.

HOW VR WORKS

VR works by enclosing the user in an artificial environment, usually via a headset, though there are room based VR technologies called CAVE (Cave Automatic Virtual Environment) where even the walls themselves are used in the experience by projecting images onto them.

While traditional games and movies are done in 2D via a display, VR encompasses the user. If a user turns his head to the side, the view will similarly change. In short, VR places the user in its simulated environment as no matter where the user looks, he'll only see the virtual environment, not the real one. It's akin to playing a first person game, except there's no end to the display no matter where you turn.

For a virtual reality headset, two different images of the same scene are projected onto the display, one for each eye. The images are the same, but are from different angles, just like how we view the world with our eyes. This tricks our brain into merging the images together, to create a 3D image from 2D images.

Depending on the technology, VR can give users a passive or interactive experience. Viewers like the Google Cardboard or the Samsung Gear VR headsets fall into passive category while devices that require a lot of computation power, like the Oculus Rift or the OSVR, are interactive experiences. While there are some interactive experiences for passive viewers, most of them simply allow a full-screen viewing experience. The same is true for the Interactive viewers, though the majority of the content will be interactive ones instead of passive.

On the other end of the spectrum are the 'real' VR headsets like the Oculus Rift, the OSVR or the HTC Vive. Both require considerable computing muscle to run well, but deliver much more immersive VR experiences.

Interactive VR requires much more horsepower than passive experiences, which is why it's pretty much out of the question for anything but a beefy desktop rig. Interactive VR gives you the freedom to not only experience the environment virtually; it also allows you to influence or interact with it in some way.

While the entertainment industry is just catching up to the idea of utilizing VR headsets and environments, the technology has long been used in the military, aviation and other industries.

THE TOP THREE THINGS NEEDED FOR A GOOD VR EXPERIENCE

Experiencing VR isn't as simple as donning a VR headset and then executing a VR app. There's much more to it than that. Our brains are hardwired in such a way that it'll only be comfortable if VR jibes with our normal reality. The main elements needed for a great VR experience are a stable 60 (or above) frames per second, a fast refresh rate and of course, minimal to no lag.

REFRESH RATE: Refresh rates are tied to frame rates. Originally made for cinemas, refresh rate determines how often an image is shown per second. So a refresh rate of 48Hz means that an image is shown twice per second. The higher the refresh rate, the smoother motion is to our eyes.

FRAME RATE: A high frame rate ensures that what you're looking at moves in a realistic and smooth matter. Even imperceptible drops can send subconscious signals to our brains, which will usually result in headaches after a certain amount of time.

LAG: Lag is the time in-between actions registering. Say for example you lift your hand in real life. It takes a .5 second later before your in-game avatar does the same. That .5 second is lag time, the time when your actions are translated by the hardware to appear in-game. In VR, lag can cause nausea as the brain simply can't understand why the motions you're making doesn't translate to what the eyes are seeing. That's why eliminating lag is one of the main tasks of any good VR headset.
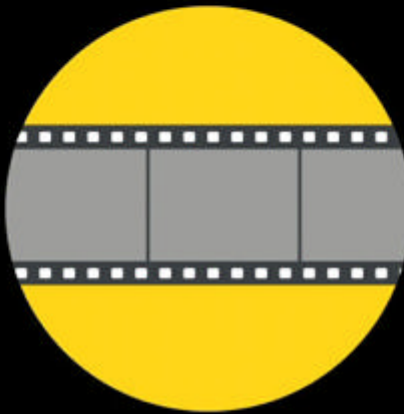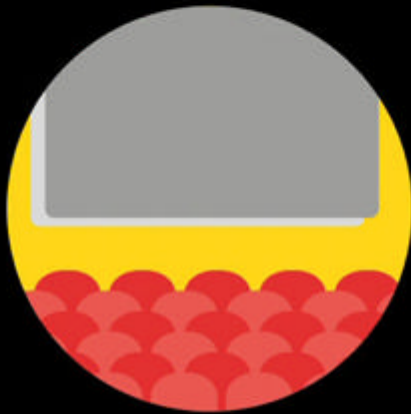
THE MAIN ELEMENTS NEEDED FOR A GREAT VR EXPERIENCE ARE A STABLE 60 (OR ABOVE) FRAMES PER SECOND, A FAST REFRESH RATE AND OF COURSE, MINIMAL TO NO LAG.

Practical VR research in education

You might think that VR (or AR) is just starting to creep into our daily lives, but the truth is schools have been experimenting with them for a while now.

Singapore's Republic Polytechnic, for example, has its students working on all sorts of VR and AR headsets under the guidance of Morgan Heijedemann, a senior facilitator at the polytechnic. Recently, for the school's 2015 Open House, he mentored Diploma of Information Technology students to come up with an Oculus Rift app that simulated a roller coaster ride through the Republic Polytechnic campus, done completely in Unity. According to Heijedemann, the app was more of a success than they anticipated, with long queues.

Apart from working with the Oculus Rift, Heijedemann has also dabbled in using Epson's Moverio BT200 AR glasses. Similar to Google Glass, the Moverio is an AR headset with dual displays (one for each eye) and is connected to a small box (the size of a smart phone) that houses the hardware and also doubles as a controller. Unlike the Oculus Rift, Heijedemann worked solo to create a rudimentary star field app for the Android based glasses, as a test on whether the Moverio would be a feasible project for the students in the future.

Heijedemann and his students have been working in the VR and AR field for a while now. In fact, he's probably one of Singapore's handful of experts in the field. His expertise has even attracted the attention of the IDA, as he's been asked to help in the Hackathon@SG 2015 event that's going to be held on the 25- 26th July.

VR VIEWERS

One of the easiest ways to experience VR is with the Google Cardboard. Anybody can get their own Google Cardboard device. You can build one yourself (Google provides instructions on how to do it online) but if you're not the DIY type, you can always buy a pre-made one from various sites cheap. That's part of the genius of Google Cardboard, the entry requirements are so low that practically nobody is excluded.

Here's the thing though. Google Cardboard isn't exactly made for commercial usage. Sure, Google distributed the plans freely, but it's mainly for the public to be exposed to what VR can do. Cardboard was and is never planned to be anything other than a test to see what is possible with a VR headset.

For a commercial product with Google Cardboard tech, there's Samsung's Gear VR. It's a much more focused product, in that it only works with certain phones. Due to that, not a lot of people will have access to it but it comes with the advantage that developers know exactly what hardware they're developing on, ensuring they can optimize that software coming out for it. The Samsung Gear VR is also much more polished, with a strap that secures the device to your face and the ability to tweak the lenses for optimal focus.

Both devices are essentially empty cases with lenses. There's a slot to place your mobile device, which is also the viewing area of the headset incidentally. So before slotting in the headset, you pick what VR app you want to run and then slot it into the Gear VR or the Google Cardboard casing once it's loaded and that's it.

TRUE VR HEADSETS

True VR headsets are those that provide an interactive virtual environment for the user. They are usually much detailed than the ones provided by viewers like Google Cardboard or the Samsung Gear VR.

For example, the Oculus Rift is a much more complicated piece of hardware. It has different focal lenses and it doesn't use a mobile device to power it. Instead, true VR headsets usually require desktops (or in the case of Sony's Project Morpheus, a PS4) to run. Providing an enjoyable VR experience requires a lot of horsepower. Various things have to be juggled to ensure that the user doesn't experience VR sickness.

VR headsets like the Oculus Rift and the OSVR give users much more mileage when interacting with virtual environments. The HTC Vive comes with base stations and wireless controllers. Although the controllers are still a work in progress, the Vive already is a step above what you can get even with the Occulus Rift in the sense that it immerses the user completely in the virtual environment.

Real VR devices are often more than just headsets, as they will have external cameras and monitoring devices to accurately convey your moment to virtual data. The HTC Vive for example, has base stations you need to set up around your room before you can even begin to use the headset. The base stations help capture the movements you make and in conjunction

AR GLASSES

AR devices are a completely different line of tech from VR. VR is Virtual Reality, substituting our normal reality with whatever one that you want. On the other hand, AR augments our reality, which is why AR stands for Augmented Reality. We're still stuck with seeing the real world, only now with extra features at our disposal.

The best known example of an AR device is probably the Google Glass. Google Glasses overlays information (projected into a tiny screen near your eye) with whatever you deem important enough. It doesn't completely replace our reality, it adds to it, though usually in the form of flat 2D images or data. It doesn't require that much hardware at all, which is why most AR devices can easily fit into custom spectacle frames.

Like VR, AR has been with us for a while now. The Nintendo 3DS was one of the first entertainment devices to us AR, with its AR cards. In fact, AR cards have already entered mainstream usage. Have you ever been asked to download an app and then view something using it? What normally looks like weird squiggly lines on a card suddenly transforms into a 3D image as soon as you view the code through an app. That's also a form of AR.

Microsoft on the other hand, claims to be pushing the envelope in regards to AR with their upcoming Hololens glasses. Instead of just data projected onto a screen, the Hololens uses holographic technology, which Microsoft claims is leagues ahead of what's everybody's doing. The projections done by the Hololens move in 3D as you do, and they shift in perspective as you move around, which is totally unlike other forms of AR.

It's notable that the Hololens is actually projecting 3D images (whether they're true holograms or not is still up for debate) without using external hardware to back it up. Everything is self-contained in the visor itself. HWM

with its controllers, portray a more believable full-body simulation.

VR headsets usually have their own built-in displays. They don't use mobile devices for displays, even though the Oculus Rift famously had a Samsung Galaxy Tab (with the smartphone guts removed) as its display while it was in its initial development stage. Most of the announced headsets have displays that are at least 1080p.

One of the major issues with any type of head mounted display is of course individual eye conditions, especially if you already wear spectacles for example. The Oculus Rift attempts to alleviate this problem by offering various lenses that can be used for normal-, short- and long-sightedness. While it may not eliminate the problem entirely, commercial VR headsets are more likely to accommodate various individual needs rather than simple viewers.

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HWM
SINGAPORE

FEATURES
VISUAL AID: A VIRTUAL REALITY PRIMER

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MICROSOFT SURFACE 3

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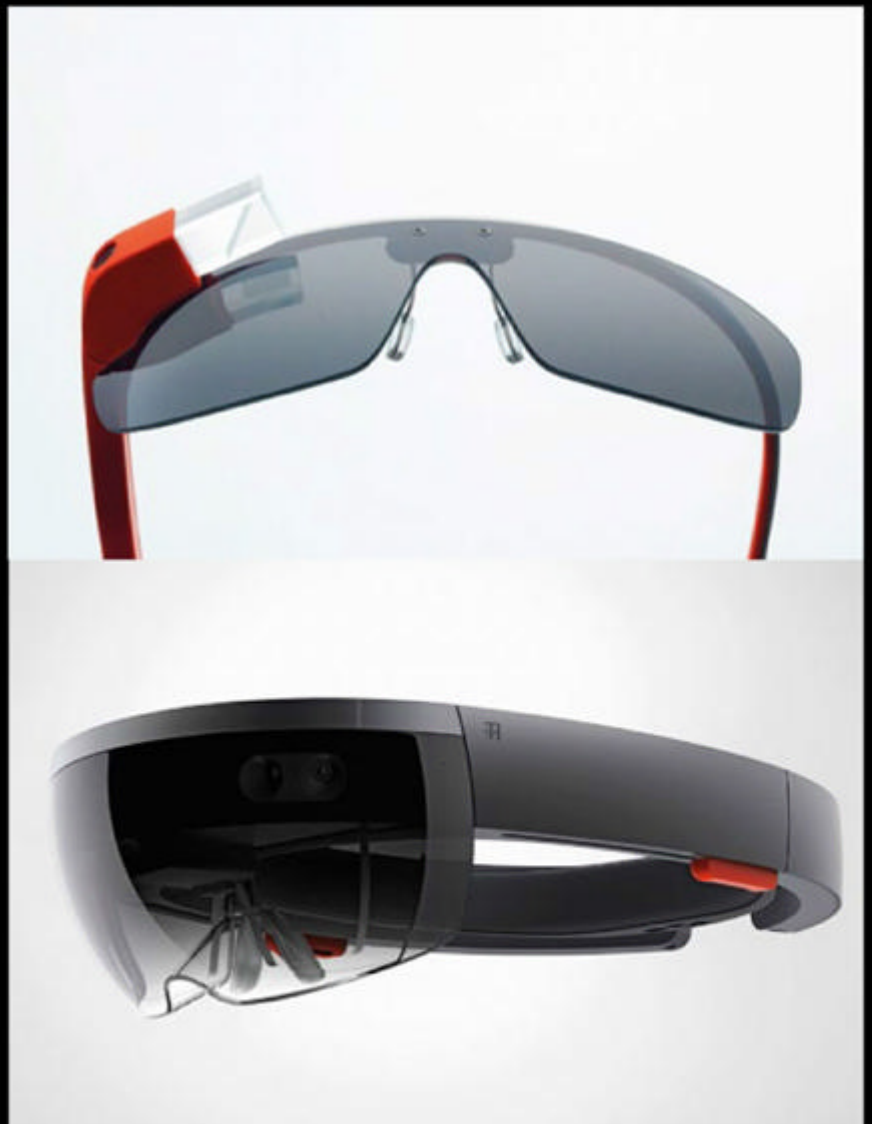
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EXPLORING THE ORIGINS OF THE COSMOS

The Hubble Space Telescope captured the iconic snapshot of the Eagle Nebula: three majestic columns of interstellar gas and dust that have since been dubbed the "Pillars of Creation". Its successor, the James Webb Space Telescope, will see even further to explore our origins.

Text by *Wanzi Koh*

MORE INSIDE>

- ASTRONOMY ON YOUR WRIST
- MORE SMARTPHONE PHOTOGRAPHY
- HOW TO HIDE ANY IOS APP WITHOUT JAILBREAKING YOUR DEVICE

SUCCEEDING HUBBLE:

Understanding the James Webb Space Telescope.

by Koh Wanzi

First launched in 1990, the Hubble Space Telescope (HST) helped propel a new wave of discoveries about the universe, even allowing scientists to pin down its age with greater precision than before. Its advanced optics and unique vantage point in space allowed it to see farther than most ground-based telescopes.

Hubble captured dazzling images of the cosmos. People thought of space as a black void speckled with stars, but Hubble showed it in almost phantasmal bursts of color and light.

Its successor, the James Webb Space Telescope (JWST) will build on Hubble's work, peering further back in time to view the formation of distant galaxies.

STUDYING THE BEGINNINGS OF OUR UNIVERSE

JWST was conceived as an instrument to study galaxy, star and planet formation in the universe. Even light takes time to traverse the vast distances in space, so when astronomers observe a distant celestial object, they're actually looking into the past. And the farther out they look, the further back in time they can see.

Star and planet formation in the local universe takes place in the centers of dense, dusty clouds, a process that can only be observed by a telescope primed to detect longer wavelengths – like near-infrared light – that escape the clouds. Galaxy formation emits near-infrared light as well, and astronomers are hoping JWST will pick up on that too.

Thanks to its larger mirror and greater light-collecting area, JWST can look further into the past than Hubble and study the first stars and galaxies that formed when our universe was still young.

The universe is now widely accepted to be around 13.7 billion years old. JWST will be looking to observe the formation of stars and planets when it was just 100 to 250 million years of age.

	JWST	HUBBLE
Size	22 x 12m	13.2 x 4.2m
Wavelength	Infrared	Ultraviolet and visible
Orbit	1.5km away; does not orbit Earth	Orbits 570km above Earth
Primary Mirror	6.5m diameter	2.4m diameter

SEGMENTED, GOLD-COATED MIRROR

JWST's primary mirror is six times the size of Hubble's, but has only one-tenth its mass. Its mirror will consist of 18 hexagonal beryllium mirror segments, which will unfold as JWST launches. This allows the mirror to fit into the launch shroud of the rocket that will take it into space.

Beryllium is also known for its high strength per unit weight. Beryllium is already used in many components of supersonic aircraft because of its light weight, stiffness, and dimensional stability, the latter of which is a measure of how temperature affects the linear dimensions of a material. It was chosen for the mirror for precisely these reasons – JWST will operate at below -220°C, so the mirrors need to remain stable at low temperatures.

And because gold absorbs blue light but reflects red and infrared light extremely well, the individual segments are gold-coated to optimize them for greater sensitivity to infrared wavelengths.
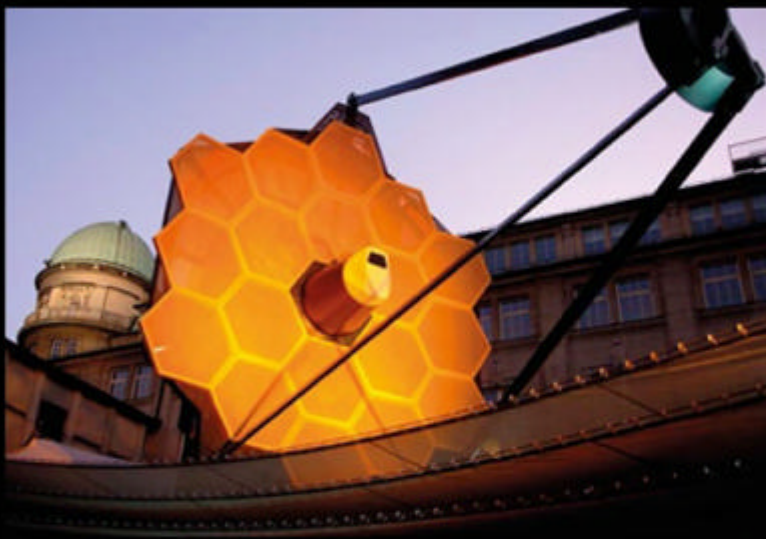
INTERSTELLAR OBSERVER

JWST will be located at a point called the Earth-Sun L2 Lagrange point, which will help it stay cool. This is especially important for an infrared telescope. The five-layer sunshield shields the various mirrors, detectors and filters from sunlight and heat from infrared light.
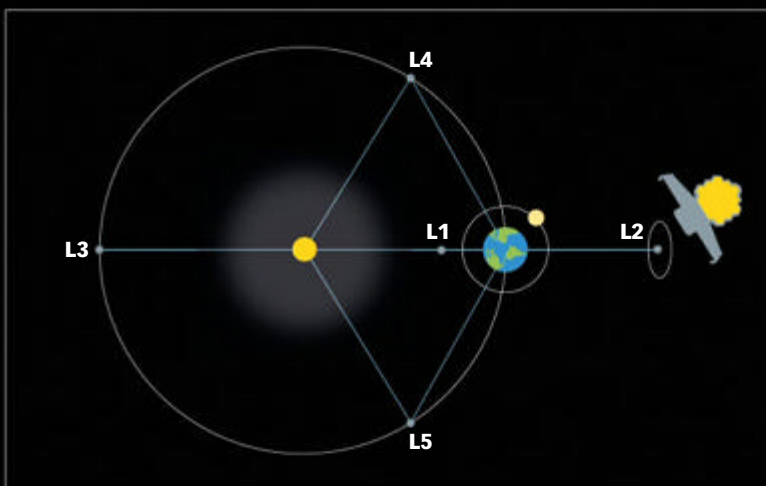
LAUNCHING JAMES WEBB

JWST is still under construction and is scheduled for first light in October 2018. It will be launched by an Ariane 5 ECA rocket and will officially begin its mission six months after its launch, with an expected mission lifetime of between five-and-a-half to 10 years.
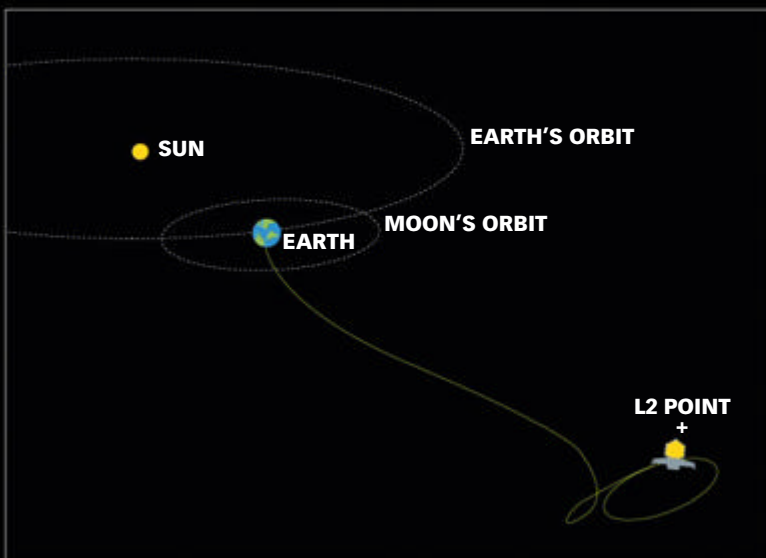
JWST's Orbit at the Earth-Sun L2 Point.

WATCHES IN-DEPTH:

Types of astronomical complications.

by *Kenny Yeo*

Thanks to modern inventions such as GPS and digital maps, man no longer needs to rely on complicated maps and mechanical contraptions navigate the Earth. While not as practical as they once were, astronomical watch complications that tell the position of the Earth, Sun and stars still exist as a celebration of how far the human race has come. More than that, it also serves as a showcase of a watchmaker's mastery over science and engineering. Still not convinced? Think of it this way. Anyone can read Google Maps, but when technology fails, you will finally be able to prove your alpha worth by being the only person who can read the sun and stars.

Here are some examples of astronomical complications.

EQUATION OF TIME

The equation of time complication is a rarely seen complication and is often only found on very complex pieces. The equation of time shows the difference between apparent solar time and mean solar time. Apparent solar time is sometimes also referred to as true solar time and refers to the time that it is obtained by precisely measuring the position of the sun. Mean solar time is the time that we all know, with noons set 24-hours apart.

If we were to track the true solar time over a year, we would find that a day is only exactly 24 hours long four times a year. For the rest of the year, it varies between plus and minus 16 and 14 minutes respectively. This explains why if you were to look at a sundial, you might find that it's running slightly fast or slow. The reason for this phenomenon is due to two factors: the earth does not orbit round the sun in a perfect circle, and it does not orbit the sun at the same plane.

An example of a watch with an equation of time complication is the Audemars Piguet Royal Oak Equation of Time. Apart from the equation of time display, it also features a perpetual calendar, moonphase indication and sunrise and sunset timings set for the city displayed on the dial ring.

SIDEREAL TIME

Another uncommon astronomical complication that is somewhat related to the equation of time and solar time is sidereal time. Whereas solar time is dependent on the position of the sun, sidereal time is measured by using the position of fixed stars. Briefly, sidereal time is the measure of time based on the Earth's rotation relative to fixed stars. In other words, a sidereal day is the time it takes for a fixed star to reappear at the same location.

A sidereal day is on average about four minutes shorter than a solar day. This is because as the Earth rotates on its own axis, it is also rotating around the sun. By the time it has made a rotation around its own axis, it would also have moved a little along its orbit around the sun. As a result, it needs to rotate a little more around its own axis so that the sun would reappear at its highest point, marking a complete solar day. Fixed stars are so far away from Earth that Earth's movements along its orbit around the sun would make no difference in their apparent direction and position.

Frankly, there's little use for knowing the sidereal time for most people, but in the past, the sidereal time is used by astronomers and navigators to keep time so that they know where to point their telescopes to find stars without worrying about where the Earth is in its orbit.

The IWC Sidereal Scafusia displays sidereal time in a 24-hour format in a sub-dial at 12 o'clock and behind the watch is a specially customized celestial chart showing the constellation based on the owner's location. On the watch back are also indications for a perpetual calendar and times for sunrise and sunset.

ORRERY

One of the most romantic and visually arresting complications in all of horology is the orrery, or sometimes also referred to as a planetarium. An orrery is simply the display of the relative positions of the planets and moons. This was used in the past to quickly discern the location of the various planets in our solar system. And the best way to explain this is to look at the watch we have here - the Van Cleef & Arpels Midnight Planetarium.

On the dial you will see concentric rings and on each ring is a small round stone. These stones denote a planet in our solar system. Although there are eight planets in our solar system, there's unfortunately only enough space for six on the dial, so each stone represents one of six planets closest to the Sun - Mercury, Venus, Earth, Mars, Jupiter and Saturn. The Sun is represented by the large gold stone in the middle. Each of these planets will orbit the Sun in the middle in real-time. Hence, Earth, represented by the blue stone, will make a revolution in 365 days; while Mars, on the other hand, will take just 88 days.

Apart from the orrery, the Midnight Planetarium watch also features the above mentioned equation of time display on the rear side and also has a perpetual calendar complication. Time is indicated in a 24-hour format and is read by looking at the position of the shooting star on the dial.

5 REASONS TO GO LAMPFREE WITH CASIO'S HYBRID PROJECTORS

Casio's laser and LED hybrid projectors outshine the competition, plus they're environmentally friendlier. Here's how they benefit both you and the planet.

by *Alvin Soon*

To find out more about Casio products, go to **www.casio-intl.com/sg/en/**

LAMPFREE LASER AND LED HYBRID PROJECTORS ARE THE FUTURE

All projectors use a light source to create an image, by either passing the light through LCD panels or by reflecting it from an imaging device, like a DLP chip. Lampfree laser and LED hybrid projectors are more durable, reliable, environmentally friendly and cost-effective than conventional mercury lamp-based projectors.

By combining laser and LEDs to provide light, Casio's hybrid projectors do away with the conventional lamp while delivering high brightness and true-to-life colors. At the time of writing, Casio has already achieved more than 90%* of the global market share in the Laser and LED hybrid projector category.

LAMPFREE PROJECTORS ARE FRIENDLIER TO THE ENVIRONMENT

Casio's lampfree projectors use laser and LED hybrid light sources that are free from mercury. Mercury is a hazardous chemical, and although it's been phased out of many products, it continues to be used as a light source for conventional projector lamps. Casio has eliminated mercury entirely from its products, for the good of its users and the environment.

LAMPFREE PROJECTORS SAVE MORE ON POWER AND COST

Casio's laser and LED hybrid light sources have extremely long light hours of 20,000 hours, and reduce overall energy consumption by half, cutting power costs dramatically. By going lamp and filter-free, there's also no need to worry about frequent lamp and filter replacements.

Altogether, this adds up to greatly reduced Total Cost of Ownership, with long-term savings on cost. Lower power consumption also leads to less carbon dioxide emissions, which makes it the perfect choice for environmentally conscious organizations that want to reduce their carbon footprint.

Brightness

100%

Laser & LED Hybrid Light Source

Conventional models (high-pressure mercury lamp)

Reduced brightness degradation and a longer life!

Time
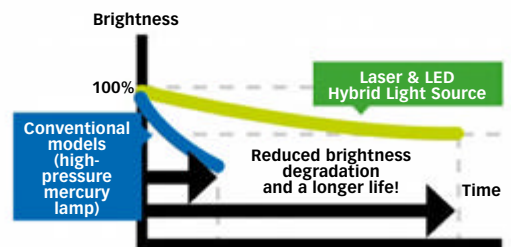
BIGGER PICTURES AT LOWER COST

When compared to flat panel displays, projectors are able to create larger images for far less cost. The screen size is adjustable and can be changed to fit the screen, and most projectors can also be easily carried from location to location, without risking damage. They are also easier to install, simply plug in a source or transmit wirelessly to start using. If you have a large meeting room, classroom or hall, projectors make it far easier to get a larger image for everyone to see.

60 inches screen	179 - 199 cm
77 inches screen	233 - 259 cm
80 inches screen	243 - 270 cm
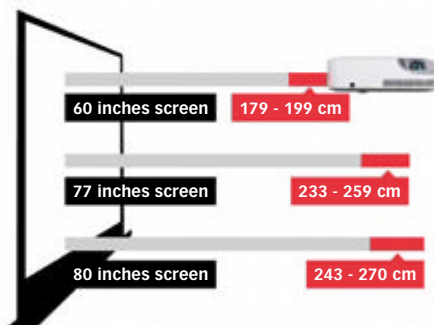
LAMPFREE PROJECTORS SAVE PRECIOUS TIME

Unlike conventional lamp projectors that need time to warm up, laser and LED hybrid projectors achieve full brightness in seconds. They also don't require cooling down periods when shutting down, and can be turned off instantly. No more waiting around for the projector means time saved and productivity increased. Plus, while conventional lamp projectors tend to degrade after the first lamp replacement, Casio's laser and LED hybrids remain bright and clear.

Lampfree 5 sec.

100%

MercuryLamp Model

0%
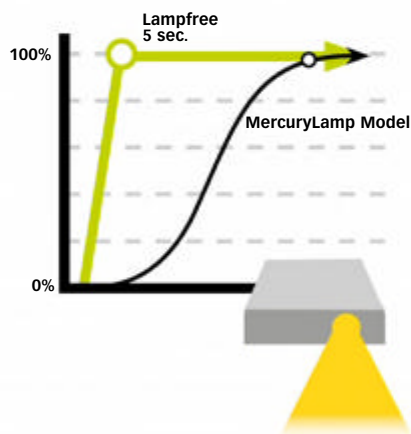
CASIO XJ-V1: SAVES THE ENVIRONMENT AND COST WITHOUT SACRIFICING PERFORMANCE

The XJ-V1 forms the Core series of Casio's lampfree laser and LED hybrid projectors. The mercury free projector is perfect for environmentally conscious organizations; with up to 35% lower power consumption, as low as 120 watts. Reduce your electricity costs every year, as well as save on replacement costs with the lampfree and filter-free design.

The XJ-V1 is uniquely designed with a tightly shielded light source, to prevent dust entering and protects the longevity of the projector.

*Worldwide XGA & WXGA, 2500 – 4499lm, LED/Laser Phosphor category, in terms of volume.

LampFree *for a brighter future*

MADE IN JAPAN

# TIPS FOR CREATIVE PHOTOS WITH THE OPPO N3

by *Marcus Wong*

The OPPO N3's camera stands out for its ability to swivel, but there's a lot more to it than that. If you own the OPPO N3, here are some quick tips to getting the most out of the images taken with its camera.

SHOOT LIKE A PRO

Smartphones are our default camera because they're always on us and simple to use. However, greater control over your camera is generally the first step towards getting better images, and with the OPPO N3, that comes by enabling Expert Mode*. This gives you full control over White Balance, ISO, Exposure and Focal distance; thus letting you take full creative control.
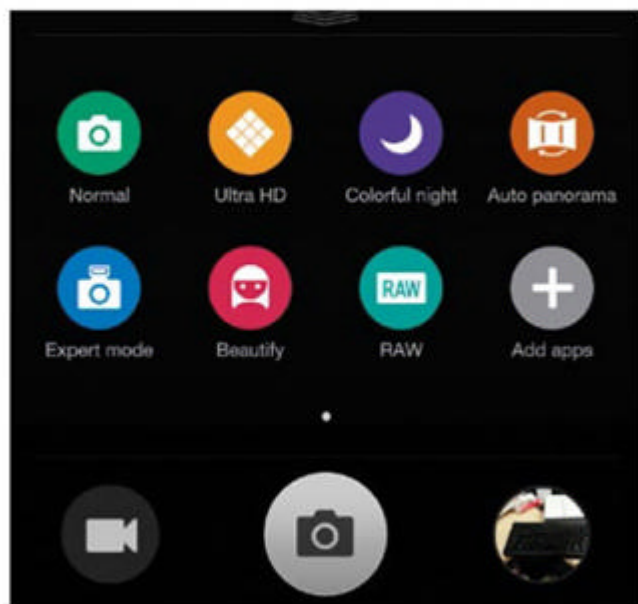
COLOR ME AWESOME

We commonly think of setting White Balance as just a means of getting colors accurate, but having the ability to set it manually also means you can use it to creative effect. For example, if you want to add more blue to your picture, try shooting it with White Balance set to Tungsten, the camera will try to compensate for what should be a more orange scene, giving you a resulting image that has deeper blues.
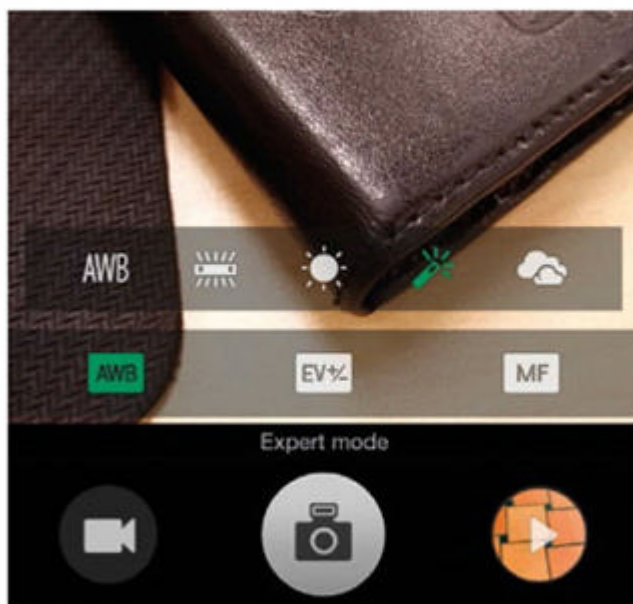
SET YOUR LIGHT (AND DARK)

The EV+/-function lets you adjust how bright or dark the image will be, and again this can be used to creative effect. If you want to focus on just the highlights in the scene, under expose by moving the slider towards the negative values (ie -1 or -2) so that the overall scene gets darker, placing more emphasis is on the brighter areas.
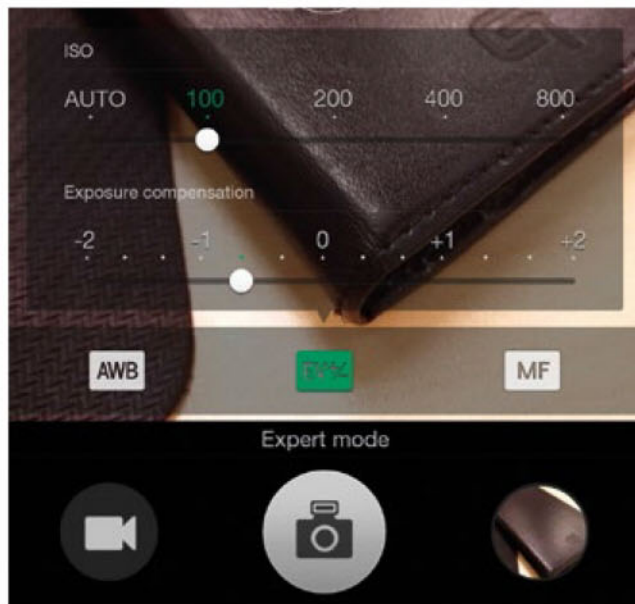
KEEP YOUR DISTANCE

Sometimes you need the focus of a picture to be squarely on a single point. In such instances, switch to the Manual Focus function and select your focus point by distance. That's about as accurate as you can get, and you can even use zoom in by doing a reverse pinch on the screen.
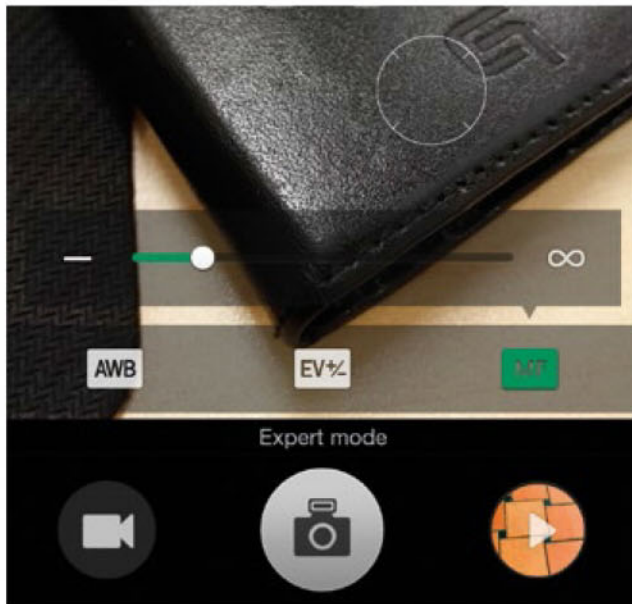
PLAY WITH THE ANGLES

Generally speaking, when you're taking portraits, you want to keep the camera level so you don't introduce distortion. That said, sometimes playing with camera angles adds to the idea you're trying to convey. For example, shooting from a low position can convey a greater sense of power, or can make a small skip seem like a huge jump.

To do this to an extreme, place the N3 flat on the ground and swivel the camera to your desired angle. All you need to do is tap and hold on the screen in the camera function and drag your finger up or down to rotate the camera. (After disabling touch shutter of course)
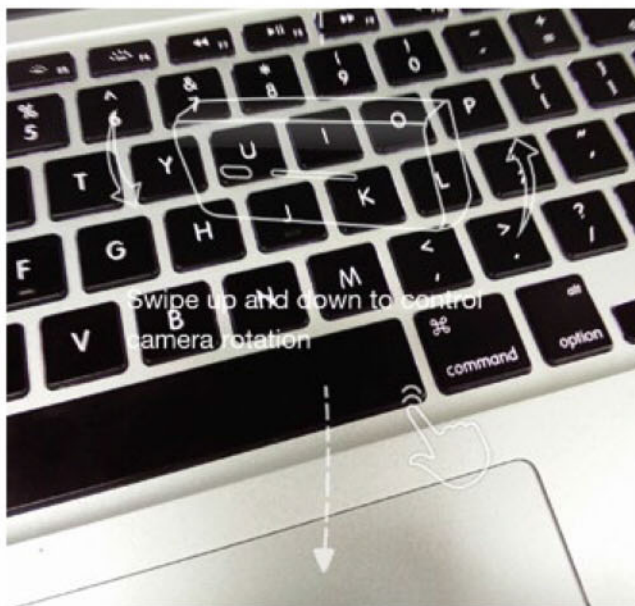
GET THE MOST OUT OF EVERY CAPTURE

While this doesn't operate in tandem with the Expert Mode, the OPPO N3 has a RAW* shooting mode that lets you capture images in Adobe's .dng RAW format. Akin to having a film negative that you take to process, this allows you to adjust the exposure of the image captured and white balance after you've shot it, thus letting you get the most out of the image file.

*Expert Mode and RAW shooting apps aren't enabled by default, so to enable them, swipe up on the camera screen and choose to add app.
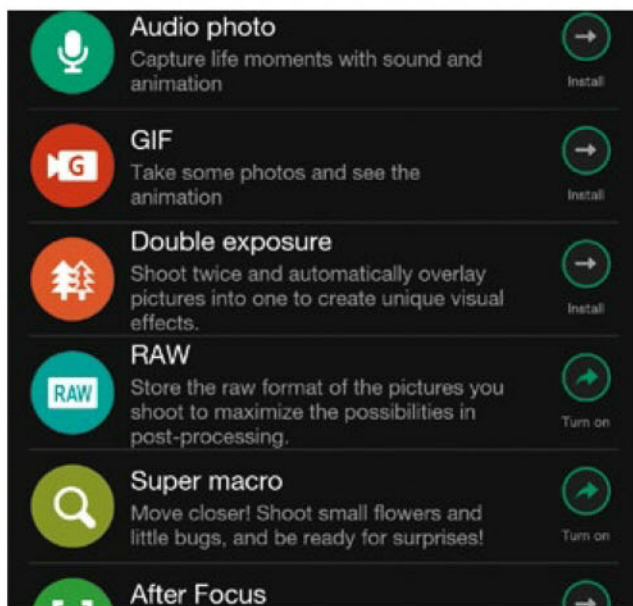
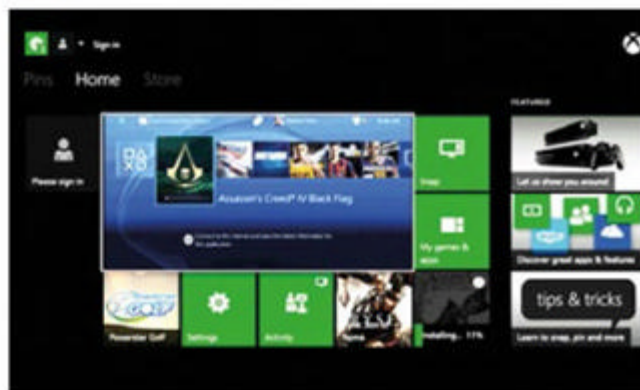# 5 THINGS YOU MAY NOT KNOW THE XBOX ONE COULD DO

by *Salehuddin Husin*

Previously, we taught you about the things you might not know your PS4 could do. Well, this month we're back yet again with something similar, except for the Xbox One!

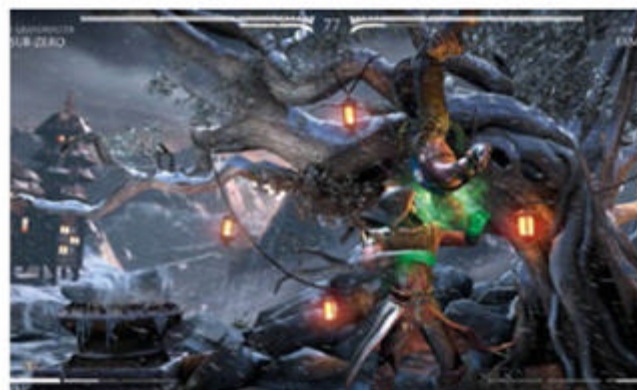## PLAY A PS4 (OR ANYTHING WITH A HDMI OUTPUT) ON AN XBOX ONE

The Xbox One can output HDMI to a display and accept HDMI input from another device. If you have any device that outputs via HDMI (PS4, Xbox 360, desktop computer or notebook), you can use a HDMI cable and connect the device via HDMI to the Xbox One's HDMI input slot and view the image from the other device via the Xbox TV app.

The upside is that now you can control and view everything with just one channel. The downside is you have to have the Xbox One on to be able to use this feature.

GET FREE MOVIES AND TV SHOWS

Since the Xbox One is an entertainment platform, it actually gets regular promotions for free content.To receive these promotions though, you'll need a US Xbox Live account to access the US Xbox Live store.

Go to Settings > System > Language & Location to do it. You're going to have a US address handy too as you're going to need to fill in a real life US address under Settings > Payments & Billing. The best way to do it is to sign up for a freight forwarding service like Comgateway, which comes with your own custom US address. If you use a US billing address though, chances are your local credit card information won't work (though some banks might allow it).

SCREENSHOTS

It might be surprising, but the Xbox One lacked the ability to take screenshots until a few months ago. To take a screenshot, double tap the Home button. Done right it should open a mini cross menu with different options. Pressing Y will grab a screenshot. It's trickier to use than the PS4's method (since the gameplay doesn't pause while the menu is loading) but it's still better than nothing. Alternatively, if you have the Kinect plugged in, you can just say "Xbox, take a screenshot" for the system to automatically take a screenshot without any further input from you.


SUSPEND AND RESUME

Suspend and Resume lets you continue your game from where you left it. It's pretty much the same thing as the Suspend/Resume function on the PS4, though the Xbox One has had it since it launched. Play a game normally and when you're done, you can just save the game (or not) and then turn off the Xbox by holding down the Home button and then choosing to turn the Xbox Off. A small caveat though, the Xbox's Instant On setting has to be enabled, which means the Xbox One has to be constantly connected to a live power supply, similar to how the PS4 needs to be in Rest mode for its Suspend/Resume function to work. It also won't work for games that require a constant online connection, like Neverwinter or Destiny. You'll be logged out once you turn off the Xbox and be at the login page when you turn on the console again.

THE XBOX ONE MEDIA PLAYER

The Xbox One originally launched with hobbled media playback options which infuriated early adopters. It has since been updated to surpass other console's capabilities. If you haven't touched the Media Player since you got your Xbox One, you might want to try and see if it plays your videos now. Supported file formats now range from 3gp to H.264.
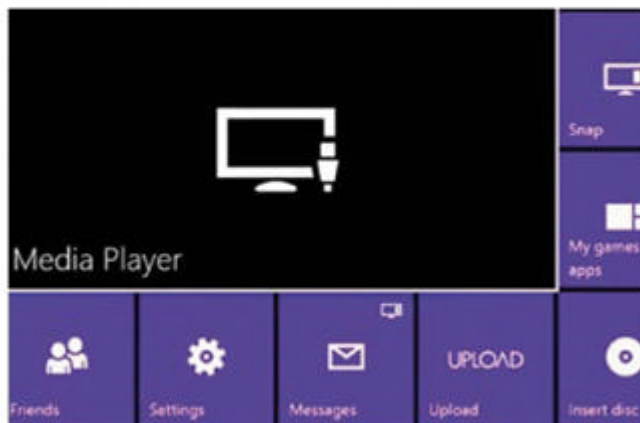
XBOX REWARDS

Xbox Rewards is a program that rewards you for spending and playing Xbox games. You can do surveys, refer your friends and tasks to get credits, which you can then convert to real money that's credited to your Xbox Live account. Even better, if you're a Xbox Rewards member, spending on the Xbox Marketplace gets you rebates. The more you spend, the higher your rebate percentage.
http://rewards.xbox.com
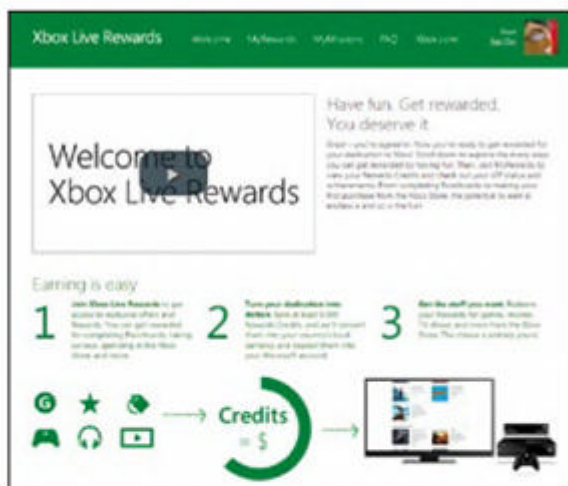
XBOX AMBASSADORS

If you love helping fellow gamers out and are knowledgeable about the Xbox 360 or Xbox One, you can always apply to be an Xbox Ambassador. You get points for helping out by answering questions in the forum or chat, which then levels up your account. Levelling up gets you exclusive loot for your Xbox Avatar, as well as other prizes like free games and Xbox Live subscriptions. Best of all, it's free and you can stop doing it whenever you feel like it.
https://xcl.xbox.com

3 THINGS TO KNOW ABOUT THAT FREE WINDOWS UPGRADE

by *Ng Chong Seng*

In case you missed it, Windows 10 for PCs and tablets will be available on July 29, 2015. How do you get it, and how much does it cost? Here are some quick answers.

1) HOW DO I GET WINDOWS 10?

Windows 10 is a free upgrade for qualified Windows 7 and Windows 8.x devices, but it's available for only one year from the time the OS is available. Now that we know that Windows 10 will be released on July 29, 2015, this means you've until July 29, 2016 to take advantage of this offer.

If you purchase a new Windows 8.1 device between now and July 29, the Windows 10 upgrade will be available to you and many retail stores will upgrade your new device for you. If you already have a qualified device, you can now reserve your free Windows 10 upgrade through the Get Windows 10 app.

2) WHAT IS THIS GET WINDOWS 10 APP? I DON'T SEE IT!

You should have this Get Windows 10 (GWX) app if you're using a geninue copy of Windows, and your system is up to date (at least Windows 7 SP1 or Windows 8.1 Update, with KB3035583 update installed). Look for the small GWX icon in your taskbar, click on it, and follow the instructions. Once the OS is ready to be installed come July 29, you'll receive another notification.

If you don't see the icon but are sure that your system qualifies and your OS is up to date, try this handy script over at gHacks: http://gohwz.ws/1BcvIAd

3) WHAT IF I DON'T HAVE AN EXISTING WINDOWS 7 OR 8.1 LICENSE, OR I MISS THE FREE UPGRADE PERIOD?

Microsoft has revealed that Windows 10 Home will cost US$119 and Windows 10 Pro US$199. These match the current prices of Windows 8.1 and Windows 8.1 Pro. If you bought Windows 10 Home and want to upgrade to Pro later on, the upgrade price is US$99.

There may be separate SKUs for OEMs and system builders, but Microsoft hasn't said anything about that as of this writing.

SECURING YOUR MOBILE DEVICE

by *Koh Wanzi*

We live in an age of mobility. Your smartphone is probably as indispensable, if not more so, than your laptop or desktop PC. Our phones have become repositories of vital data, and the proliferation of mobile devices makes them ripe targets for attackers looking to capitalize on the mobile wave. We bring you a few of the best security apps to guard your data against malicious attacks and physical theft.
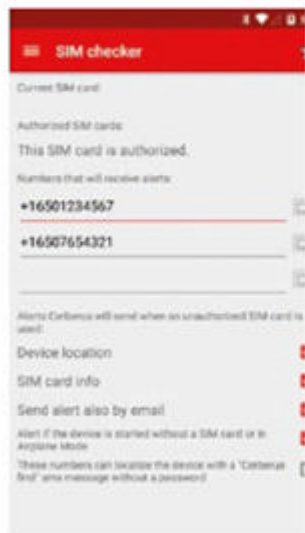
CERBERUS
Android
Free

Named after the three-headed dog that guards the entrance to the underworld, Cerberus offers three-pronged protection for your mobile phone. In the event of a theft, you'll be able to remotely control your phone from both the desktop site and from another phone via SMS and wipe your device if needed. Furthermore, the app will send you automatic email or SMS alerts to alert you to activity on your missing device, such as when a SIM card is changed. And in addition to comprehensive location tracking, it will even email you a photo of the thief if a wrong unlock code is entered!

Cerberus will send alerts to authorized devices about the status of your missing phone.

360 SECURITY
Android
Free

360 Security is an anti-virus app that doubles as a speed booster to help optimize your background apps, memory space and junk files. It has consistently achieved one of the highest detection rates among tested security apps, and its real-time scanner works to safeguard your device from malware, spyware and other infections. In addition, it can detect and address system vulnerabilities to beef up the security of your phone. Apps and local APK files are scanned and the installation process is monitored for any unwanted malicious activity, so you can rest easy knowing that you've not unwittingly opened a backdoor into your phone.
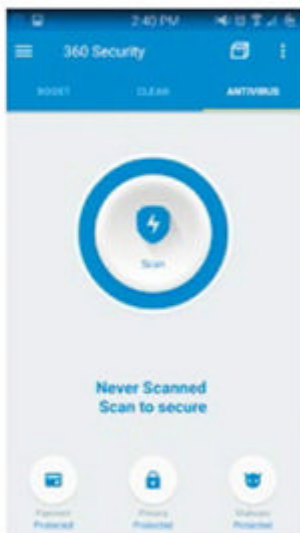
360 Security safeguards your phone against viruses and other malicious software.

ONESAFE
iOS/Android/WIndows
$6.68/$5.98/Free

Security experts will tell you to use a different password or pin for every account. But with so many accounts to secure, it can often be a struggle to keep track of all the usernames and passwords. oneSafe is a password manager app that aims to help you securely organize your log-in credentials. It features AES-256 encryption to secure your data against attacks, and email and device backup functions to guard against data loss. It's also quite intuitive to use, with ready-made categories to help you organize your information, a built-in password generator to create strong passwords and Dropbox integration to sync across multiple devices.

oneSafe's intuitive interface makes it easy to secure and manage multiple passwords and credentials.

REDPHONE: PRIVATE CALLS
Android
Free

RedPhone helps secure the most basic – and perhaps most overlooked – function of your phone by giving you free, end-to-end encryption for your calls worldwide. The app is quite hassle-free as it works with your regular phone number. In addition, you can bypass voice call charges because the app works over a Wi-Fi connection or your data plan. RedPhone uses an encryption protocol called ZRTP, and you can now place calls to anyone with the assurance that no one is listening in, provided the other party has the app installed of course.
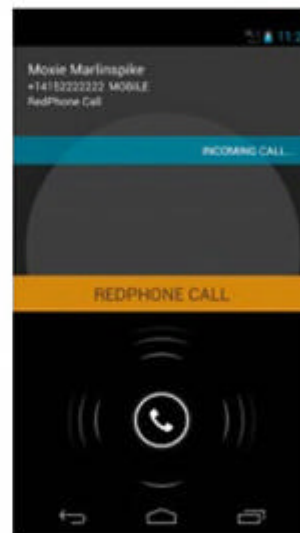
RedPhone allows you to place secure calls to anyone with the same app, anywhere in the world.

HOW TO HIDE ANY IOS APP WITHOUT JAILBREAKING YOUR IPHONE OR IPAD

by *James Lu*

Anyone with an Apple device knows how quickly your home screens can get cluttered with apps, especially with an ever increasing list of non-removable Apple apps like Newsstand, Stocks, Health, and most recently, Apple Watch. If you don't want to resort to jailbreaking your device, here's a neat little hack that exploits a glitch in iOS to hide any app you want. We're using iOS 8.3 on an iPhone 6 for this Learn, but it works on any iPhone or iPad with iOS 7 or above.

STEP 1
Make sure your first home screen is completely full of apps, with every row, including the dock filled with apps.
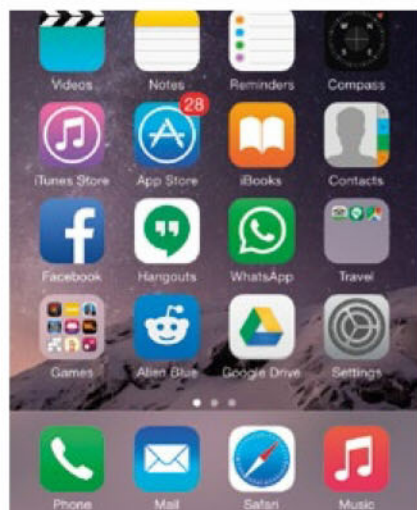
STEP 2
Put the app you want to hide on a different home screen. In this case, the Apple Watch app, since you don't have one (yet).
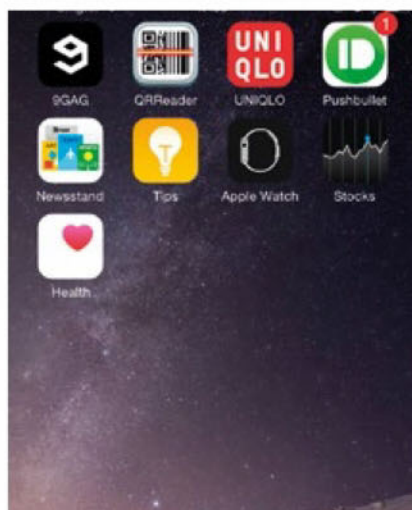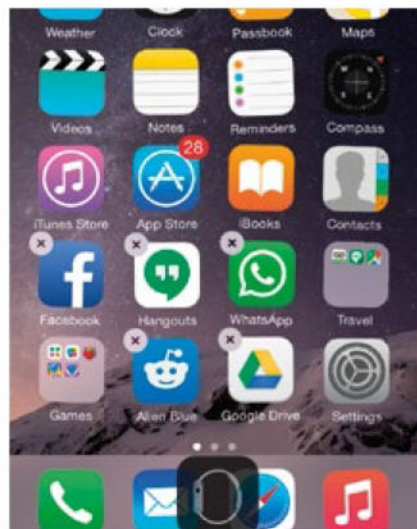
STEP 3
Drag the app you want to hide to the first home screen and drag it over another app as if you were going to make a folder. Keep your finger held down the entire time.
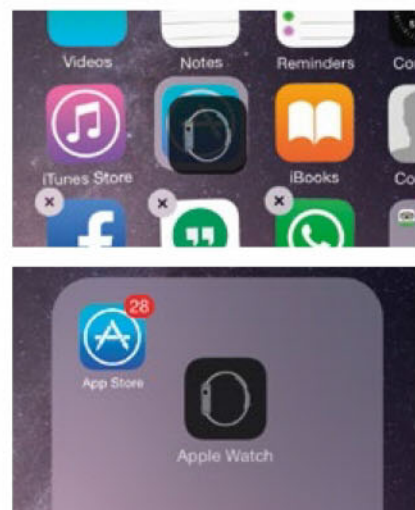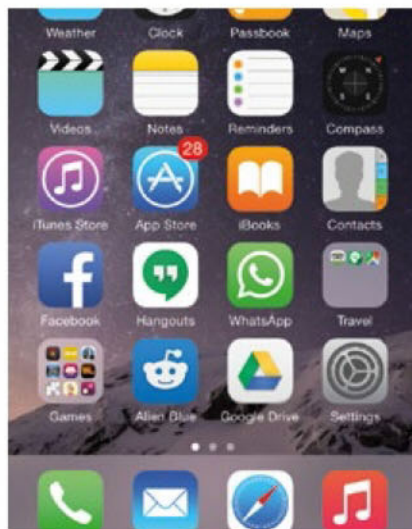
STEP 4
While still keeping your finger held down, pull the app back out of the folder and drag it to the dock.

STEP 5
Release your finger and the app will be hidden.

HOW TO FIND YOUR HIDDEN APP
Note that this will not delete the app, so it won't free up any storage space. It merely hides it from the home screen.

If you want to access it, you can do a Spotlight search (swipe down on your home screen) and the app will show up.

If you ever want the app to reappear again on the home screen, simply power off your phone for at least 30 seconds and it will come back.

The Sony PlayStation Portable (PSP) still looks very modern, but it's actually more than a decade old and can be considered a relic of a pre-connected, pre-cloud physical media age.

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• Low radiation and power consumption

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